Study of Alternative Waste K.7
Water Collection & Treatment Systems
for the 153962
Village of Sauget, Illinois
October 15, 1971

Monsanto
Enviro-Chem
Systems Inc.

[illegible] CHICAGO, ILLINOIS 60606

VS0544

Study of Alternative Waste Water Collection & Treatment Systems for the Village of Sauget, Illinois

October 15, 1971

Russell & Axon

Monsanto Biodize Systems, Inc.

Sverdrup & Parcel

Horner & Shifrin

Ryckman, Edgerley, Tomlinson & Associates

Consoer, Townsend & Associates

Engineer study cost
~~1~~100.00
132,000.00

Report of
24 MGD 12-22-70

VILLAGE OF SAUGET

'. SAUGET
Mayor

2897 MONSANTO AVENUE
SAUGET. ILLINOIS 62206

Area Code 618
337-5267

October 14, 1971

Mr. Richard J. Kissel, Hearing Officer
Water Quality Standards Revisions - #R71-14
Illinois Pollution Control Board
Suite 900
189 West Madison Street
Chicago, Illinois 60602

Dear Mr. Kissel:

At the October 6, 1971 hearing in Peoria, Illinois on the proposed Water Quality Standards Revisions - #R71-14, Mr. M. R. Foresman, testifying for Monsanto Co. and the Village of Sauget Sanitary Development and Research Association, explained that he would furnish to the Board copies of a soon-to-be completed report by Monsanto Biodize, detailing the costs involved for the Village and the Industries in Sauget to comply with Sec. 602 of #R71-14.

Please find herewith five copies of the Monsanto Biodize report. Further copies, if needed, can be obtained from Mr. J. L. Jones, Monsanto Enviro-Chem, Chicago, Illinois.

I hope that you and the other Board members will find the time to read this report, as it documents the economic impact of Sec. 602 (R71-14) upon the Village of Sauget and related industries.

Sincerely yours,

Paul Sauget

PAUL SAUGET
President of Board of Trustees.

PS/bl
Enc. 5

Monsanto Enviro-Chem Systems Inc. 10 SOUTH RIVERSIDE PLAZA / CHICAGO, ILLINOIS 60606 / (312) 782-5041

October 15, 1971

Village of Sauget Board
of Trustees
2987 Monsanto Avenue
Sauget, Illinois 62206

Attention: The Honorable Paul Sauget
President of Board of Trustees

Gentlemen:

In accordance with the agreement between the Village of Sauget & Monsanto Enviro-Chem, we submit herewith a report of our evaluation of alternative methods to handle waste water discharge from the Village.

Very truly yours,

Jerry L. Jones

Jerry L. Jones
Technical Services Manager
Industrial Water Pollution
Control

JLJ:mc

DISTRIBUTION LIST

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Village of Sauget Board of Trustees	2
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Midwest Rubber Reclaiming Co.	2
Mobil Oil Co.	1
Monsanto Industrial Chemical Co.	5
Illinois Pollution Control Board	
Samuel L. Aldrich	1
David P. Currie, Chairman	1
Jacob D. Dumelle (Hearing Officer 10/6/71)	1
Richard J. Kissel (Hearing Officer 10/6/71)	1
Samuel T. Lawton, Jr.	1
For the Record of the Hearing at Peoria, Illinois 10/6/71	1
Stanley Lind (Hearing Officer for Sauget Variance Hearing 11-8-71)	1

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APPENDICES

LIST OF DRAWINGS

LIST OF DRAWINGS

SUMMARY

Because of the proposal requiring both primary and secondary treatment for storm water in combined sewer systems, it was thought that construction of a segregated sewer system might be justified for the Village of Sauget, Illinois. The Village assigned the task of evaluating various segregation alternatives and comparing their costs with those for the combined sewer system to Monsanto Enviro-Chem Systems, Inc. of Chicago. This particular study commenced during the first part of August, 1971. Monsanto Enviro-Chem had been conducting flow measurement studies, flocculation studies, in-plant studies laboratory studies, treatment scheme evaluations, pilot plant work and preliminary process design since August, 1970 at a cost to the Village of Sauget and private industry of about $200,000.

The unit operations included in the treatment scheme being investigated in the pilot plant include screening, grit removal, neutralization, flocculation, sulfide addition, sedmentation, filtration, and carbon adsorption.

The four alternatives considered for this study have beed described in the Summary Table. The treatment plant involves the same unit operations for each case but varies in capacity from 14.85 MGD to 29.5 MGD.

The capital cost figures for the various alternatives presented should be considered rough engineering estimates with an accuracy no greater than plus or minus 35%. If one were to rank the estimates as to accuracy then the estimates for Alternatives IA & IB should be considered more accurate than II & III because of the many unknown factors involved in the inplant and Village modifications required for II & III.

The estimated capital costs for the various Alternatives are shown in the Summary Table.

Direct operating costs were calculated and several financing cases considered which would yield different indirects or amortization rates. One case involved 15 year General Obligation bonds (5½%), 30 year Revenue Bonds (6%) and private capital depreciated over 10 years. Another case involved private capital depreciated over a 10 year period. The total operating costs are also shown in the Summary Table.

Because of the limits of accuracy for the various estimates it is not possible to adequately differentiate between the alternatives on an initial cost basis. Operating costs are also very comparable for the different alternatives because the major direct operating costs do not change.

Essentially the same amount of acid must be neutralized for each case as well as the same amount of organic contamination removed by the carbon.

Various factors were considered before making any recommendations:

(1) No standards now exist for storm water sewers so that there is no way of being certain how much water would be acceptable for such a system.

(2) The cost estimates for Alternatives IA & IB are undoubtedly more accurate than those for Alternatives II & III.

(3) Revisions in the segregation plan for Alternative II could produce a capital cost comparable to that for III.

(4) More expansion capacity as far as utilization of storm water capacity for process flows and increasing storage capacity would be available for Alternative IB compared to II & III.

(5) Alternatives II & III would provide "new sewers" and offer better control of waste streams.

(6) One alternative may be very favorable to one or more of the industries but not the best solution for the Village as a whole. This would lead to some industries wanting their own segregation and treatment system with sewers bypassing the treatment plant.

(7) In order for each industry to decide which Alternative would best solve their problems, a detailed breakout of costs would be required. This was beyond the scope of this report.

(8) Perhaps construction of privately financed treatment plants should be given more thought.

With these thoughts considered, the following recommendations were made:

(1) More study work in the form of detailed design would be required to improve cost estimates.

(2) If more engineering study work is not done, Alternative IA or IB would be the safest economic choice. The final decision between the two, of course, will depend on the Pollution Control Board's rulings.

(3) If further study work is authorized, then a preliminary rate schedule and cost breakouts for the individual industries and the Village will be required to give all concerned enough information to make a decision.

If one of the alternatives involving construction of segregated sewers is recommended and finally selected by the Village, additional experimental and design work will be required for the treatment plant as well as a great deal of additional engineering work required for inplant modifications. This will definitely prevent meeting the proposed schedule in the Variance Petition (September, 1971). Even if Alternative I which involves minor sewer and inplant changes is chosen, there will have been a certain amount of time lost in the decision making process, thus possibly preventing compliance with the schedule in the Variance Petition.

SUMMARY TABLE

Alternative	Description	Sewer System	Inplant & Village Modifications	Treatment Plant	Capital Cost	TOTAL OPERATING COSTS: G.O. & Revenue Bonds + Private Capital ¢/1000 gal	G.O. & Revenue Bonds + Private Capital $/Yr.	Private Capital ¢/1000 gal.	Private Capital $/Yr.
IA	Primary Treatment For Storm Water and Secondary for Normal Flow	Combined (Existing System)	Minor	23.5 MGD	$13,400,000	49.4	4,250,000	53.2	4,560,000
IB	Primary & Secondary Treatment For Storm Water and Normal Flow	Combined (Existing System)	Minor	29.5 MGD	14,700,000	42.4	4,570,000	45.8	4,940,000
II	Primary & Secondary Treatment For Process, Sanitary & a Portion of the Storm Water	Segregated (New Process Sewer)	Major	14.85 MGD	11,500,000 (Treatment Plant) 5,000,000 (Village & Industries) 16,500,000	79.7	4,320,000	91.0	4,940,000
III	Primary & Secondary Treatment For Process, Sanitary & a Portion of the Storm Water	Segregated (New Storm Sewer)	Major	14.85 MGD	11,100,000 (Treatment Plant) 2,800,000 (Village & Industries) 13,900,000	77.6	4,200,000	86.8	4,700,000

*First 10 Years

INTRODUCTION

The Illinois Pollution Control Board has proposed that all storm water runoff in combined sewers receive, as a minimum, both "primary and secondary treatment" by Dec. 31, 1974. Prior to this proposal only "primary treatment" and disinfection would have been necessary for the storm water flow according to Technical Release 20 - 22, Second Edition.

If the Village of Sauget were to treat all storm runoff from their present "combined sewer system" in a "secondary treatment facility" either (1) additional pumping and impoundment facilities plus a 25% increase in plant design capacity would be required or (2) additional pumping facilities plus an increase in the plant design capacity by a factor at least 3.5 would be required. Naturally, to avoid the substantial increase in treatment plant size (and cost), alternative one above is preferred, with the impoundment facilities constructed upstream or in the general area of the treatment plant.

Other alternatives, however, are open to the Village and involve segregation of contaminated waste waters into one sewer system and clean water and storm water into another system. During the laboratory evaluations and inplant studies conducted by Enviro-Chem personnel at Sauget, nine alternative treatment schemes were evaluated which involved various unit operations such as lime treatment, sulfide treatment, sedimention, biological treatment, and activated carbon treatment as well as segregation of certain contaminated and clean water streams. From this study, which covered a period from August, 1970 to May, 1971 and cost the Village of Sauget approximately $51,000, a pilot plant was designed and the problem areas to be investigated were defined. During the period from May, 1971 to October, 1971 pilot plant studies were conducted at a cost to the Village of $68,500. An additional $13,000 will be necessary for engineering review of the overall project, preliminary process design, estimating, and report preparation.

It was decided after the lab studies that the treatment system would receive wastes from the combined sewer system and the Enviro-Chem's study work following was geared to meet this objective.

Because of the high additional costs that would be incurred for secondary treatment of storm water, it was decided in July that an additional engineering study should be conducted by Monsanto Enviro-Chem during August & September. This study would evaluate various segregation methods, and compare the relative costs of treating water from the present combined sewer system with those from the proposed new segregated sewer systems. Because the majority of the water being discharged from the Cerro Corporation, American Metals Climax and Midwest Rubber Reclaiming Company does not contain significant organic contaminants that would necessitate biological or activated carbon treatment, optimum economics may be derived from inplant treatment and direct discharge of water into a clean water system along with storm runoff. This clean water sewer would then bypass the Village treatment plant and discharge directly to the Mississippi River. With varying degrees of treatment within the industries, it may be possible to reduce the flow to the treatment plant by 50% or to about 12 - 15 MGD with the segregated sewer system.

During the course of the studies done for the Village of Sauget, other studies have been conducted or are in progress at American Metals Climax Company, Cerro Corporation, Monsanto Industrial Chemical Company, and Midwest Rubber Reclaiming Company, which when completed, will cost the industries approximately $50,000.

This figure brings the total cost including $12,000 for this study to about $194,000 for inplant investigations, sampling, analysis, flow measurement, laboratory studies, pilot plant studies, engineering studies, and preliminary process design involving separate sewers for the Village & industries.

It should be understood that additional time will be necessary for the Village Board of Trustees and the Village Sanitary Development and Research Association to review this report and to evaluate how each individual plant will be affected. This delay could possibly prevent meeting the deadline of February '72 for completion of preliminary process design.

It will be obvious after reading the report that some industries will be incurring high costs for equipment and sewers if a segregated sewer system is installed. Other firms will have to spend relatively small amounts to reap the benefits of such a system.

If one of the alternatives involving segregated sewers is recommended and finally selected by the Village, additional sampling, analysis, laboratory and pilot plant work will be required before preliminary process design can be completed. This will require more funds, and time, and definitely prevent meeting the original schedule contained in the Village of Sauget's variance application dated September 22, 1971.

OBJECTIVES

This study will achieve the following objectives:

(1) Determine the most economical and technically feasible method for collection and treatment of the Village water discharges.

(2) Make recommendations for inplant sewer changes as well as Village sewer modifications.

(3) Make recommendations for any additional experimental work required to design any portion of such systems recommended above.

(4) Provide an engineering cost estimate for those portions of the system which can accurately be defined at this time (i.e. new process sewer or storm sewer). Provide a rough cost estimate for all other portions of the system (i.e. Village Treatment Plant and industries' treatment systems).

SCOPE

The following alternatives will be evaluated:

I. Treatment of all water from the combined sewer system.

(A) "Primary treatment" only for storm water. Primary & secondary treatment for dry weather flow.

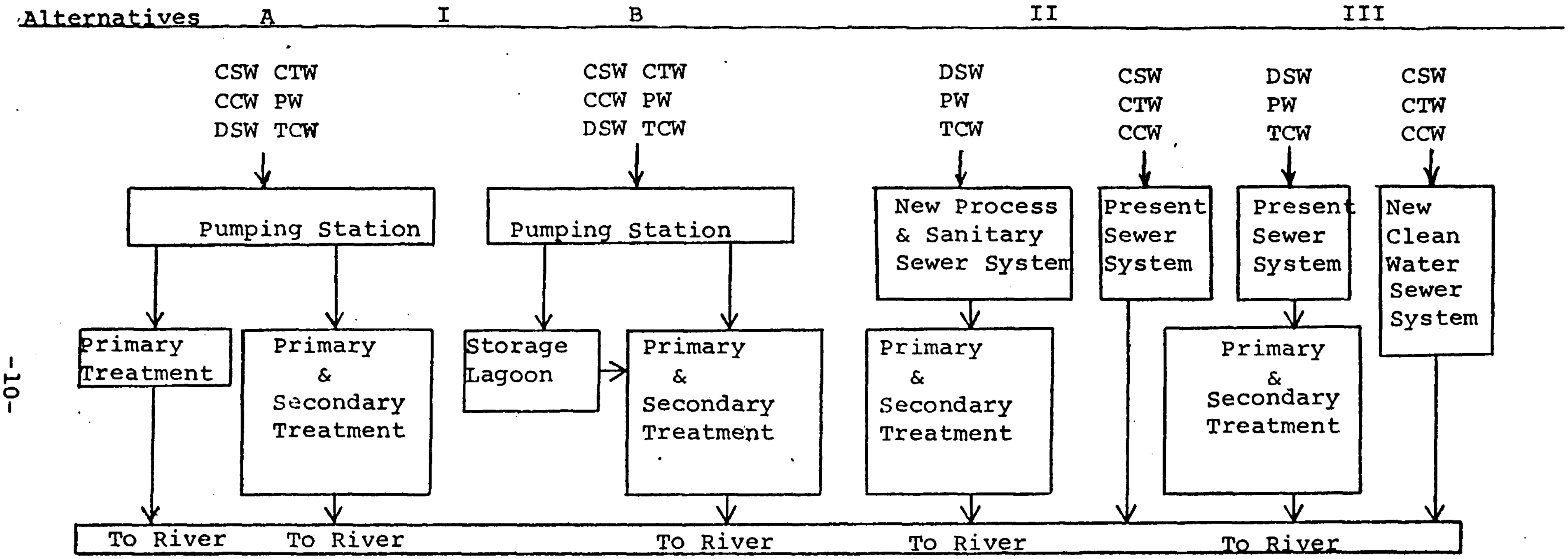
(B) "Primary & secondary treatment" for all water.

II. Construction of new "contaminated water sewers"- when possible utilizing portions of the present sewer system for process water.

III. Construction of new "clean water sewer" - when possible utilizing portions of the present sewers for storm water.

Note Figure 1 for Flow Charts.

FIGURE I
ALTERNATIVE TREATMENT SCHEMES



LEGEND

Clean Water Sewer - (no further treatment required)

CSW - Clean Storm Water

CTS - Clean Treated Water

CCW - Clean Cooling Water

Contaminated Water Sewer-(further treatment required)

PW - Process waste water & sanitary

DSW - Dirty Storm Water

TCW - Treated Contaminated Water

WATER BALANCES

Normal Dry Weather Flows

The results of the flow measurement study done for the Village of Sauget by Monsanto Enviro-Chem as well as data from various inplant studies were used to estimate normal waste water flows.

Some probable changes in operations, waste collection or segregation, and waste treatment for the individual plants have been mentioned under "System Alterations and Assumptions."

Storm Water Flows

Calculations for storm water runoff were based on the maximum 1 hour storm occurring during a two year period (1.4 inches/hr). (E.P.A. personnel at Collinsville and Springfield were contacted concerning a design storm frequency and informed us that no set design value now exists.) Calculation of runoff from various areas of the Village showing areas and values for runoff coefficients have been shown in Appendix I.

The roughness coefficient "n" for the sewers was assumed to be 0.013 for new sewers and 0.015 for old sewers. Hydraulic gradients were obtained from drawings in the Village files.

For Alternatives II & III certain production areas within plants were considered to have contaminated areas where rain water runoff would have to be conveyed to the contaminated water sewer for treatment.

System Alterations & Assumptions

American Metals Climax Company: It was assumed that 110,000 gallons per day of process water from their proposed preleach system plus sanitary wastes would be discharged to the Village treatment plant. 6.1 MGD of cooling water would be discharged to the Village treatment plant for Alternative I and to the clean water sewer or storm sewer for Alternatives II & III. Because of their highly contaminated ground water (i.e. zinc & dissolved solids) it was assumed that either a variance would be granted to allow the discharge of cooling water or they would find another source of ground water East of the plant.

The majority of the storm water flows out to the seepage pond North of the plant adjacent to Illinois Route 3. Essentially no storm water will flow into the process sewer in Alternatives II & III. Approximately 1 cfs of storm water will flow to the storm water sewer.

Note the Water Balances - Drawings 3-10 & 3-11 for flow information and Appendix II for the details of the proposed changes at American Metals Climax.

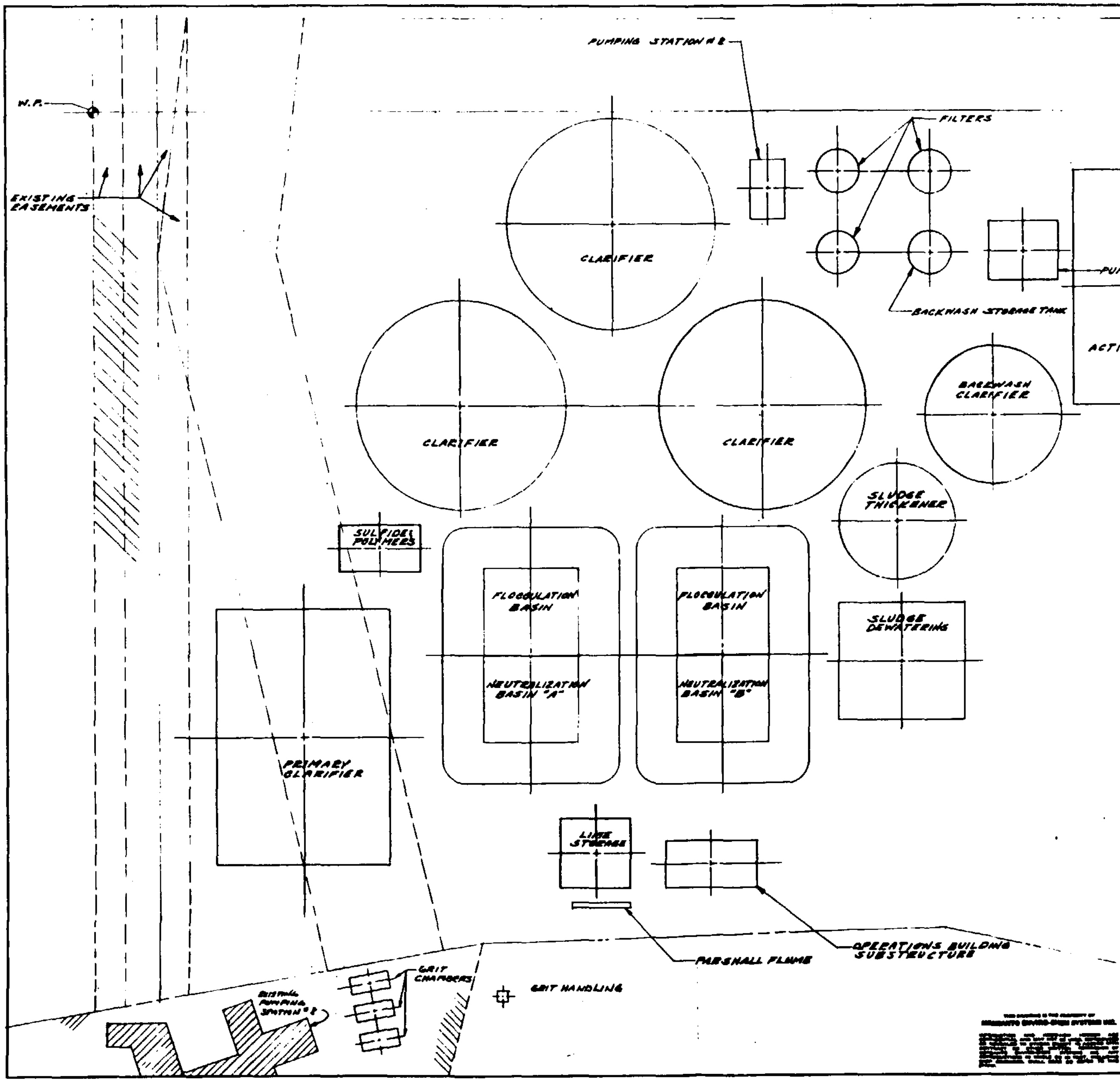
Edwin Cooper Inc.: Cooper must install an oil-water separator regardless of which alternative is chosen. This item, along with the effluent sump, was not included in our cost estimate.

It was assumed that very little, if any, of the normal waste flow of 2.2 MGD could be diverted to a clean water sewer for Alternatives II & III. A portion of the storm flow will flow North through a drainage ditch to the Seepage Pond along Route 3. Approximately 7.9 cfs will flow to the storm sewer and 5.2 cfs to the process sewer as contaminated water. This contaminated storm water will be mainly from the blending area in Department 283. For Alternatives IA & B, 13.1 cfs of storm water will flow to the combined sewer system. Note the Water Balances - Drawings 3-10 & 3-11 for flow information and Appendix III for the details of the proposed changes at Edwin Cooper. Inplant changes involve rerouting several sewers to allow segregation of contaminated water from two storm sewers. The existing East & West storm sewers will take only storm water and tie into the storm sewer for Alternatives II & III. The two existing process sewers will convey all process wastes.

Cerro Corporation: For Alternatives II & III, Cerro will have three separate sewer systems:

(1) a sanitary system discharging approximately 80,000 gal/day to the process sewer along Mississippi Ave. or Route 3.

(2) a process sewer with a new segment conveying wastes from Bldg. #19 to the existing lift station near Tube Mill No. 2 and from there flowing through the existing relief sewer along with process waste from the pond to a treatment plant. The treatment plant discharge would go to the storm sewer.



MONSANTO ENVIRO-CHEM SYSTEMS INC.

TREATMENT PLANT-PLOT PLAN
ALTERNATIVE I A
VILLAGE OF SAUGET

3-1

(3) a clean water sewer conveying water to the Dead Creek lift station for discharge to the storm water sewer,

The normal discharge to the clean water sewer would be 2.15 MGD with about 0.6 - 0.9 MGD going through the treatment plant. Essentially no storm water would be discharged to the process waste sewer system except for some runoff (1 cfs) from the area between the Metal Receiving Bldg. & Bldg #19. It may be possible to keep this water out of the sewer and this was not included in the calculations.

Note the Water Balances - Drawings 3-10 & 3-11 for flow information and Appendix IV for details of the proposed changes at the Cerro Corporation.

Midwest Rubber Reclaiming Company: Midwest Rubber will probably convert their present once through well water cooling system to a closed loop cooling tower system if Alternatives IA or IB are chosen. Their normal process flow plus sanitary waste discharges of 150,000 gallons/day will be discharged untreated to the combined system.

For Alternatives II & III process and sanitary wastes would be collected in three sumps and pumped to an overhead line along with wastes from scrubbers. These wastes would flow through an existing sewer on the South side of the plant and tie into the Mississippi Ave. process and sanitary sewer.

A portion of the storm water from Midwest drains naturally to seepage ponds. The remainder would go to the plant sewers and out to the Mississippi Ave. storm sewer. Cooling water will also flow to this sewer for Alternatives II & III. When the storm sewer is overloaded, water will flow through the relief sewer to Dead Creek.

Note the Water Balances - Drawings 3-10 & 3-11 for flow information and Appendix V for details of proposed modifications at Midwest Rubber.

Mobil Oil Company: Because Mobil has essentially no water discharges except boiler blowdown and rainwater runoff, no inplant modifications must be made. One cleanup project though, which is necessary, involves cleaning oils and residues from the 19th St. surge ponds.

Monsanto Industrial Chemicals Company: For Alternatives IA & IB the normal flow of 12.6 MGD will be discharged.

For Alternative II a decision had to made whether the process sewer should be an overhead pressure line or an underground sewer. After discussions with Monsanto personnel concerning (1) underground obstructions (i.e., well water lines, city water lines, fire water lines, electrical cables, telephone cables, and process lines) (2) the number of departments which must have sewers and the fact that they would all be VCP, (3) the possible advantages of having sumps to hold spills, it was decided that a system of sumps and an overhead process sewer would be specified for Alternative II.

Because sanitary wastes are present in the Village sewers which now tie into the South Trunk sewer (note Drawing 7-1) wastes collected in the Village including storm water will be pumped from a sump into the overhead process line running through the Monsanto plant. Running a new sewer system through the Village residential area to handle storm water would be unreasonable. However, the state might allow normal flows to go through the process waste system and to the treatment plant with the storm water excess going into the clean water system despite its slight contamination with municipal waste.

For the collection system within Monsanto, thirteen acid-proof, tile-lined sumps with one operating pump and one spare would be required. The overhead line would be reinforced fiberglass pipe supported on existing pipe racks. The sumps would be about 10 feet in depth because all existing process sewer lines must flow by gravity to the sumps. Details of the proposed inplant changes are contained in Appendix VI. Note the Water Balances - Drawings 3-10 & 3-11 for flow information. It should be noted that approximately 3 MGD or 2100 gpm of clean water could be segregated and diverted to the clean water system.

For Alternative III a new underground reinforced concrete storm sewer system would be installed within Monsanto and tie into the new Village storm water system. Note the Water Balances

Drawings 3-10 & 3-11 for flow information and Appendix VII for details of the proposed inplant changes.

<u>Village of Sauget</u>: Drawing 7-1 shows the existing Village sewer system. For Alternatives IA & IB no modifications would be necessary.

The Village must add a number of additional vitrified clay tile process sewer lines and a sump plus pumps for Alternative II. In Drawing 7-2 the sewer system has been shown. Along the Mississippi Ave. trunk sewer, the existing 21" sewer will be used as a process sewer carrying the process and sanitary wastes from Midwest Rubber Reclaiming and the sanitary wastes from Cerro. The other existing line will convey storm water from Midwest Rubber in addition to the cooling water.

Storm and sanitary water from the Village residential area, Sterling Steel Casting Company, and Roger's Cartage will be conveyed to a sump through the existing sewers and pumped to the overhead line running through Monsanto.

The existing clean water from Cerro and Monsanto will flow through the existing sewers directly to the Corps of Engineers Pumping Station.

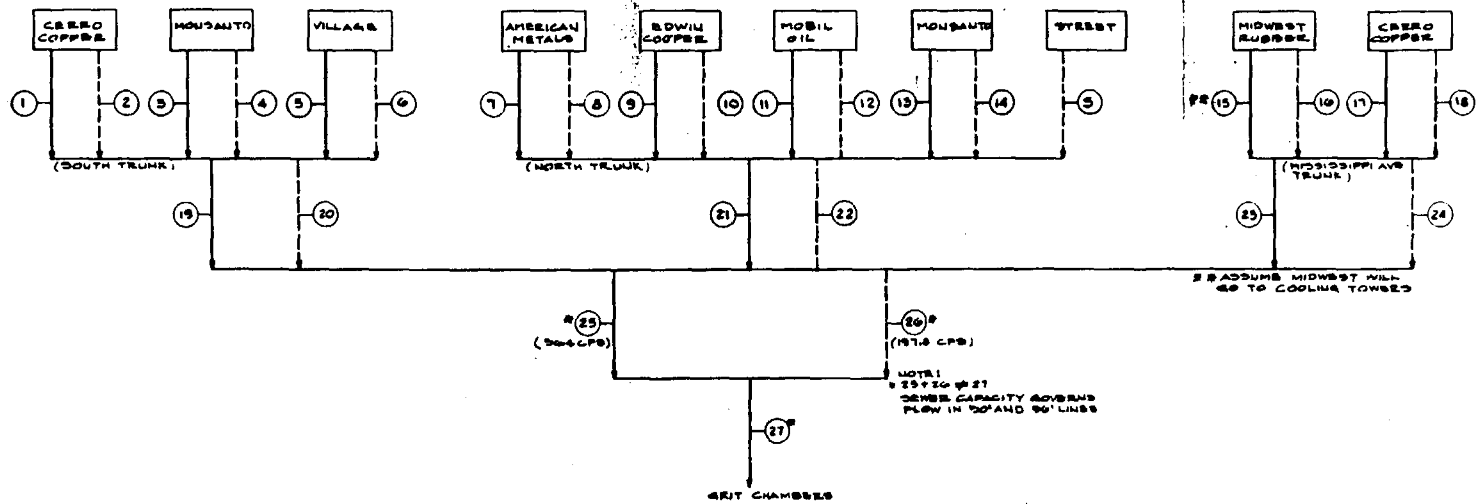
Process waste water from Edwin Cooper and American Metals Climax will be collected in a new sewer line along Monsanto Ave. which would connect with the new line from Monsanto and the Mississippi Ave. process sewers. From this junction point the waste would flow through two new 36" VCP sewers to the treatment plant.

A new concrete sewer would convey waste water from the Corps of Engineers Pumping Station to the River.

For Alternative III the Mississippi Ave. sewers would be utilized in the same way as for Alternative II. A new 72" reinforced concrete sewer would run along the South Trunk lines and pick up clean water and storm water from Cerro and Monsanto. A 30" - 48" concrete sewer, would run along the North Trunk Sewer. The lines from the South Trunk and North Trunk would junction directly East of the Terminal Railroad right of way and a 72" concrete line plus two of the existing 36" clay sewers would convey the water to an 84" concrete sewer under the levee to the Corps of Engineers pumping station. It would be necessary to increase the capacity of the Corps of Engineers Pumping Station.

STREAM NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25*	26*	27*	S			STREAM NO
MGD	1.7	20.6	12.2	64.5	4.1	3.16	6.21	0.648	2.2	8.46	0.01	10.8	0.4	9.94	0.17	5.24	86	0.645	14.0	88	88	53.9	0.66	5.87	23.8	122	85	4.16			MGD
CFS	2.64	31.8	18.9	99.5	6.6	4.9	9.6	1.0	3.4	13.1	NEG.	16.7	0.62	15.4	0.26	8.1	4.78	1.0	21.7	196.2	196.2	82.6	1.04	9.1	36.4	188.1	128.5	6.4			CFS

ALTERNATIVE-I (USE PRESENT COMBINED SEWER SYSTEM)



MGD — MILLIONS OF GALLONS/DAY
CFS — CUBIC FEET/SEC.
——— NORMAL FLOW
- - - - - STORM FLOW {1 HOUR DURATION}
STORM FLOW BASED ON MAXIMUM RAINFALL - 2 YEAR STORM
PROCESS FLOWS - AVERAGE FLOWS

MONSANTO ENVIRO-CHEM SYSTEMS INC.

WATER BALANCE ALTERNATIVE I
VILLAGE OF SAUGET
STUDY OF ALTERNATIVES
WASTE WATER COLLECTION SYSTEM

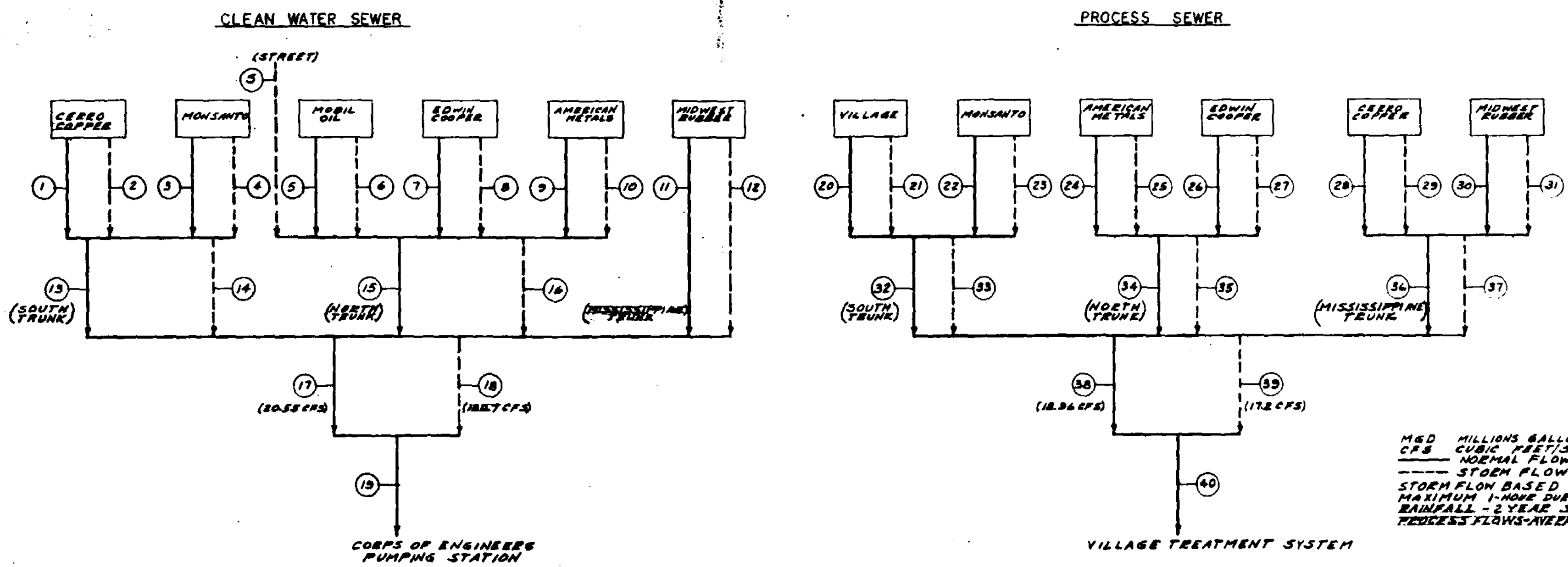
0733

5-10

STREAM №	1	2	3	4	5	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	STREAM №
MGD	2.18	20.6	3.0	64	10.6	0.01	10.8	0	5.1	6.1	0.65	2.0	5.1	5.1	84.4	6.1	27.0	13.3	104.5	130.0	0.1	3.2	9.6	4.68	0.1	0	2.2	3.36	0.05	0	MGD
CFS	3.34	31.8	4.62	33.8	16.2	NEG.	16.7	0	7.9	9.46	1.0	3.1	7.9	7.99	181.0	9.46	41.8	20.55	180.7	201.25	0.16	4.9	14.9	7.1	0.16	0	3.4	5.2	0.08	0	CFS

STREAM №	30	31	32	33	34	35	36	37	38	39	40			STREAM №
MGD	0.17	0	9.7	7.78	2.2	4.34	0.22	0	12.2	11.1	23.3			MGD
CFS	0.26	0	15.06	12.0	3.84	6.2	0.34	0	18.96	17.2	36.16			CFS

ALTERNATIVE II – NEW PROCESS SEWER
ALTERNATIVE III – NEW STORM SEWER

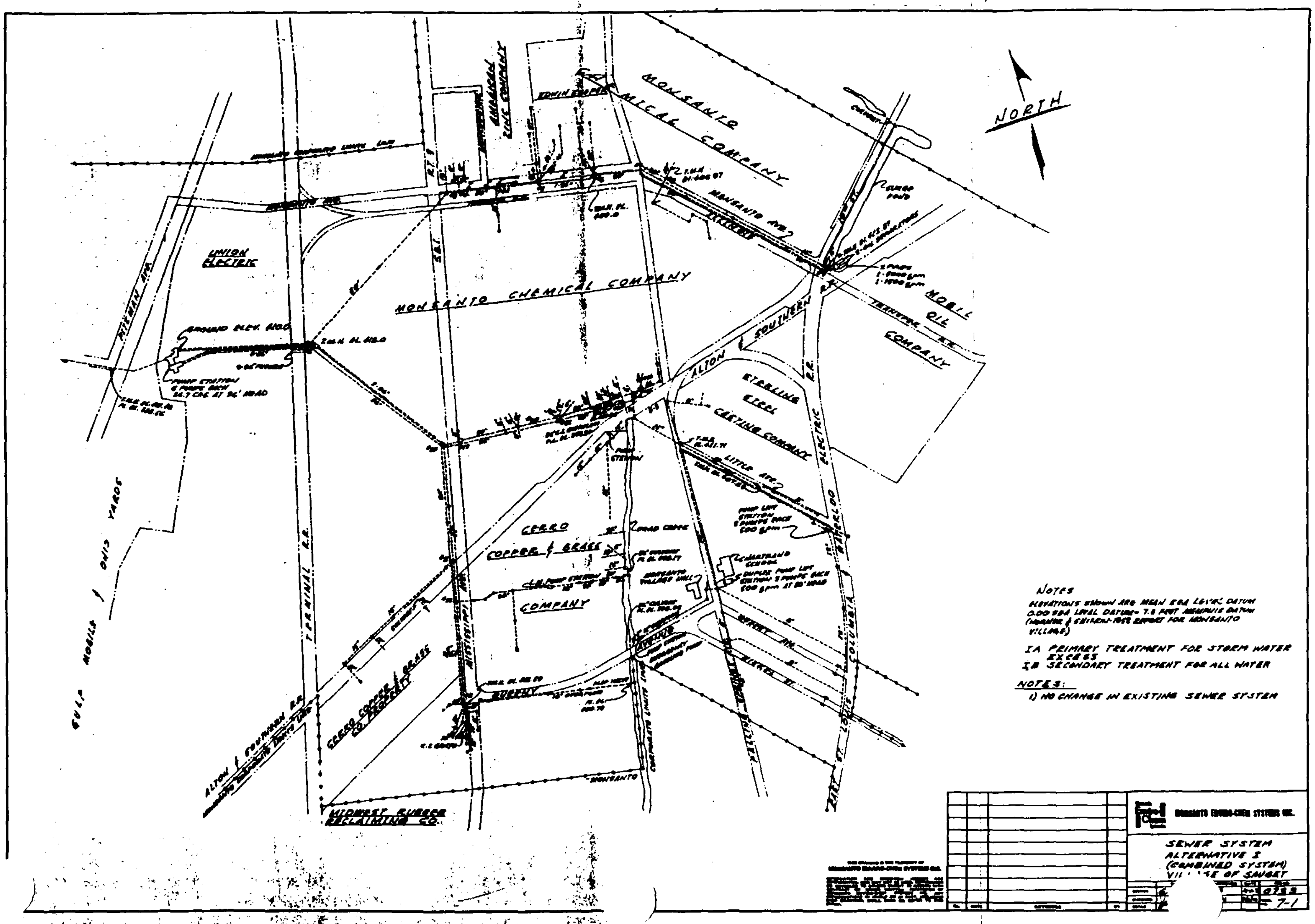


MGD MILLIONS GALLONS/DAY
CFS CUBIC FEET/SEC.
——— NORMAL FLOW
- - - - STORM FLOW
STORM FLOW BASED ON MAXIMUM 1-HOUR DURATION RAINFALL – 2 YEAR STORM
PROCESS FLOWS – AVERAGE FLOWS

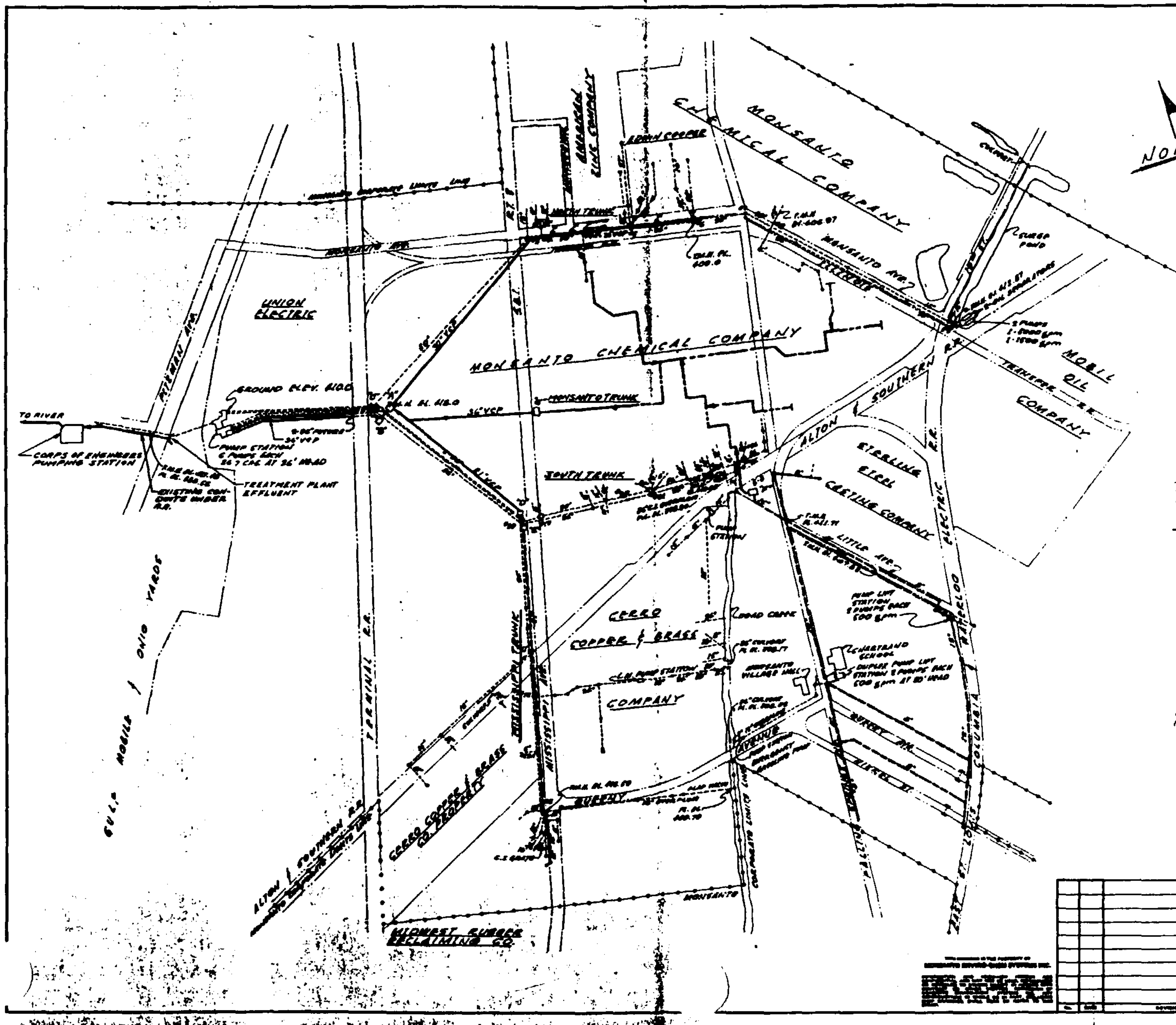
MONSANTO ENVIRO-CHEM SYSTEMS INC.

WATER BALANCE
VILLAGE OF SAUGET
STUDY OF ALTERNATIVE WASTE WATER COLLECTION SYSTEM

0933
3-11



NORTH
MONSANTO CHEMICAL COMPANY
MONSANTO CHEMICAL COMPANY
MONSANTO AVE.
MOBIL OIL COMPANY
TERMINAL R.R.
ALTON & SOUTHERN R.R.
STERLING STEEL CASTING COMPANY
LITTLE AVE.
WATERLOO ELECTRIC R.R.
CERRO COPPER & BRASS COMPANY
CERRO COPPER & BRASS CO. PROPERTY
ALTON & SOUTHERN R.R.
MIDWEST RUBBER RECLAIMING CO.
UNION ELECTRIC
GROUND ELEV. 410.0
PUMP STATION
GULF MOBILE & OHIO YARDS
AMERICAN ZINC COMPANY
EDWIN COOPER
RT. 3
MISSISSIPPI AVE.
COLUMBIA
MONSANTO
SURGE POND
Notes
ELEVATIONS SHOWN ARE MEAN SEA LEVEL DATUM
0.00 SEA LEVEL DATUM = 7.5 FEET MEMPHIS DATUM
(HORNER & SHIFRIN-1958 REPORT FOR MONSANTO VILLAGE)
IA PRIMARY TREATMENT FOR STORM WATER EXCESS
IB SECONDARY TREATMENT FOR ALL WATER
NOTES:
1) NO CHANGE IN EXISTING SEWER SYSTEM
MONSANTO ENVIRO-CHEM SYSTEMS INC.
SEWER SYSTEM
ALTERNATIVE I
(COMBINED SYSTEM)
VILLAGE OF SAUGET
7-1



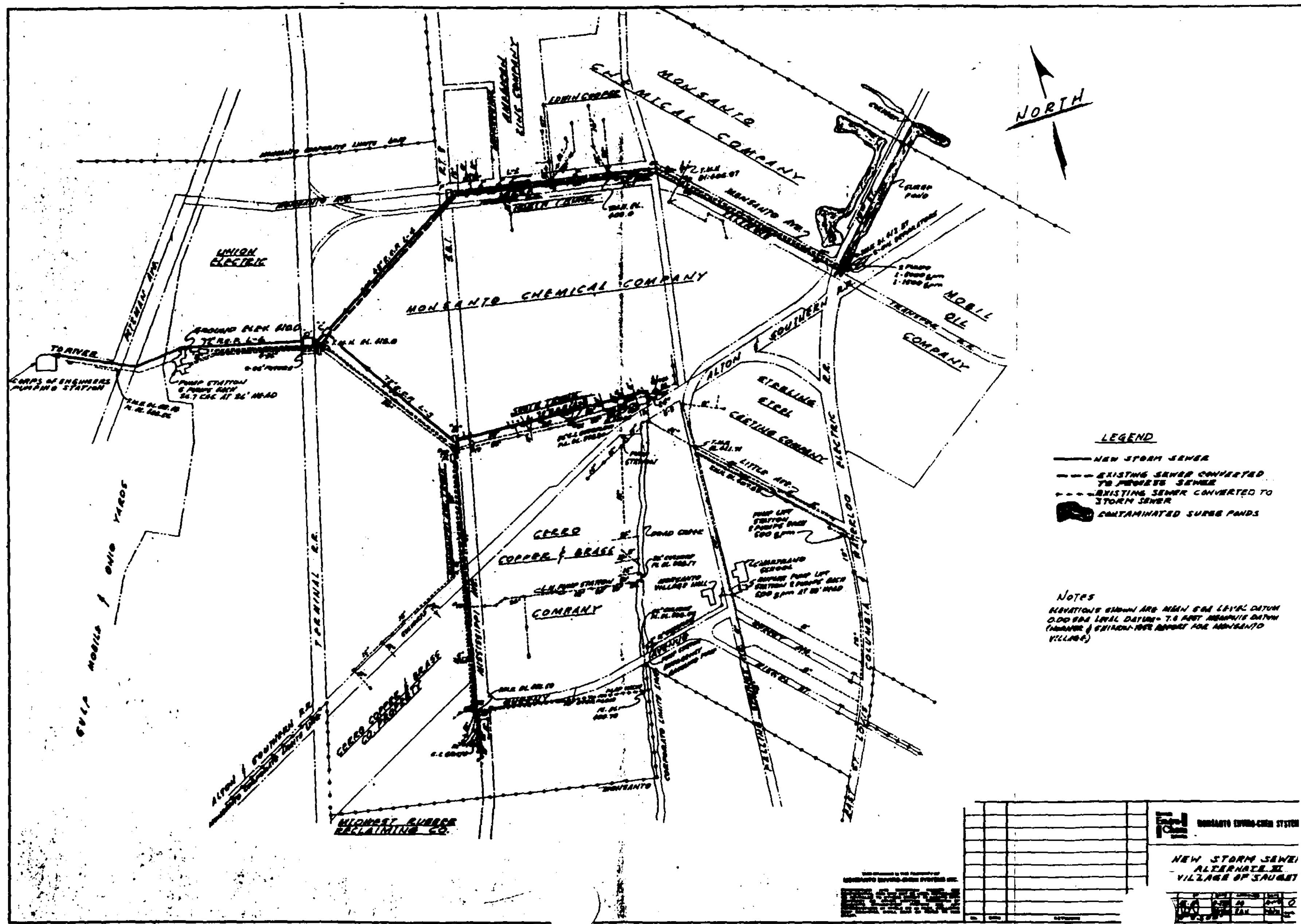
LEGEND:
- NEW PROCESS SEWER
- EXISTING SEWER CONVERTED TO PROCESS SEWER, REMAINING LINES TO SERVE AS STORM SEWER.
- MONSANTO SUMP DISCHARGE FROM COLLECTION POINTS WITHIN MONSANTO
- VILLAGE COLLECTION SUMP
- CONTAMINATED SURGE PONDS

NOTES: MANHOLE NO'S FROM H&S REPORT
ELEVATIONS SHOWN ARE MEAN SEA LEVEL DATUM
0.00 SEA LEVEL DATUM = 7.8 FEET MEMPHIS DATUM
(HORNER & SHIFRIN-1958 REPORT FOR MONSANTO VILLAGE)

MONSANTO ENVIRO-CHEM SYSTEMS INC.

NEW PROCESS SEWER
ALTERNATE II
VILL[illegible] OF SAUGET

0733
7-2


NORTH
MONSANTO CHEMICAL COMPANY
MONSANTO CHEMICAL COMPANY
UNION ELECTRIC
CERRO COPPER & BRASS COMPANY
STERLING STEEL CASTING COMPANY
MOBIL OIL COMPANY
MIDWEST RUBBER RECLAIMING CO.
GULF MOBILE & OHIO YARDS
TO RIVER
CORPS OF ENGINEERS PUMPING STATION
MONSANTO AVE.
LITTLE AVE.
WATERLOO ELECTRIC R.R.
ALTON & SOUTHERN R.R.
TERMINAL R.R.
LEGEND
NEW STORM SEWER
EXISTING SEWER CONVERTED TO PROCESS SEWER
EXISTING SEWER CONVERTED TO STORM SEWER
CONTAMINATED SURGE PONDS
NOTES
ELEVATIONS SHOWN ARE MEAN SEA LEVEL DATUM
MONSANTO ENVIRO-CHEM SYSTEMS
NEW STORM SEWER
ALTERNATE VI
VILLAGE OF SAUGET

VILLAGE TREATMENT PLANT

From our laboratory work and preliminary pilot plant results, a tentative set of flow diagrams and plot plans have been prepared in order to estimate the costs for the Village treatment plant for the various alternatives. Because it was necessary to pick design parameters for the clarifiers, multi-media filters, sludge thickener, sludge dewatering devices and the carbon system three months earlier than planned, some equipment may be sized conservatively. Two cases in point are the clarification system and the multi-media filtration system.

Drawing 3 - 12, page , shows the flow pattern for Alternative IA with the storm flow diverted through a large primary clarifier and then to the Mississippi River.

Drawing 3 - 13 page , shows the flow pattern for Alternatives IB, II and III in these cases the storm flow will be bypassed to a storage lagoon and bled back through the treatment plant at a controlled rate. It should be noted that the basic unit operations for treatment are the same but that the plants have different design flows:

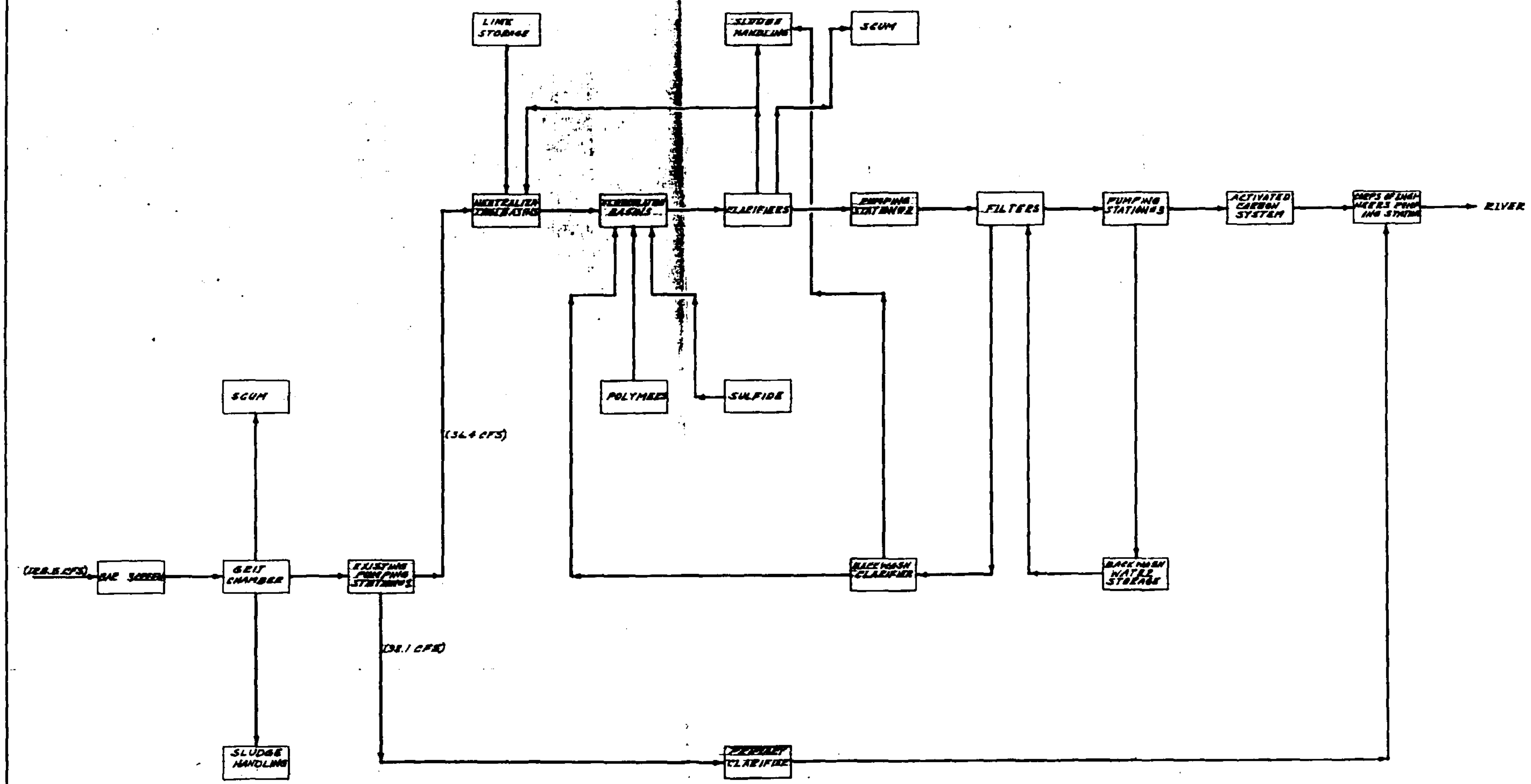
	Design Flow	Normal Flow
IA	36.4 cfs (23.5 MGD)	36.4 cfs (23.5 MGD)
IB	45.8 cfs (29.5 MGD)	36.4 cfs (23.5 MGD)
II & III	23.0 cfs (14.85 MGD)	19 cfs (12.25 MGD)

Alternatives II and III have the same type and size of treatment plant. The difference between these schemes is the method of segregation within the Village and industries, & the end result will be the same.

Utilization of the existing treatment plant equipment varies for Alternates (IA & B) and (II & III). For Alternatives IA and IB the North portion of the existing pumping station must be redesigned and renovated to pump storm water to either a primary clarifier or to a storage lagoon. The present clarifiers will be utilized as neutralization and flocculation basins.

For Alternatives II and III no revision in pumping capacity at the station will be necessary but the storm water will be pumped over to a storage lagoon from the existing South portion of the station. New neutralization and flocculation basins will be constructed and the two existing clarifiers utilized for clarification.

The plot plans for IA, IB and (II & III) are shown in Drawing 3-1, 3-2 and 3-3.

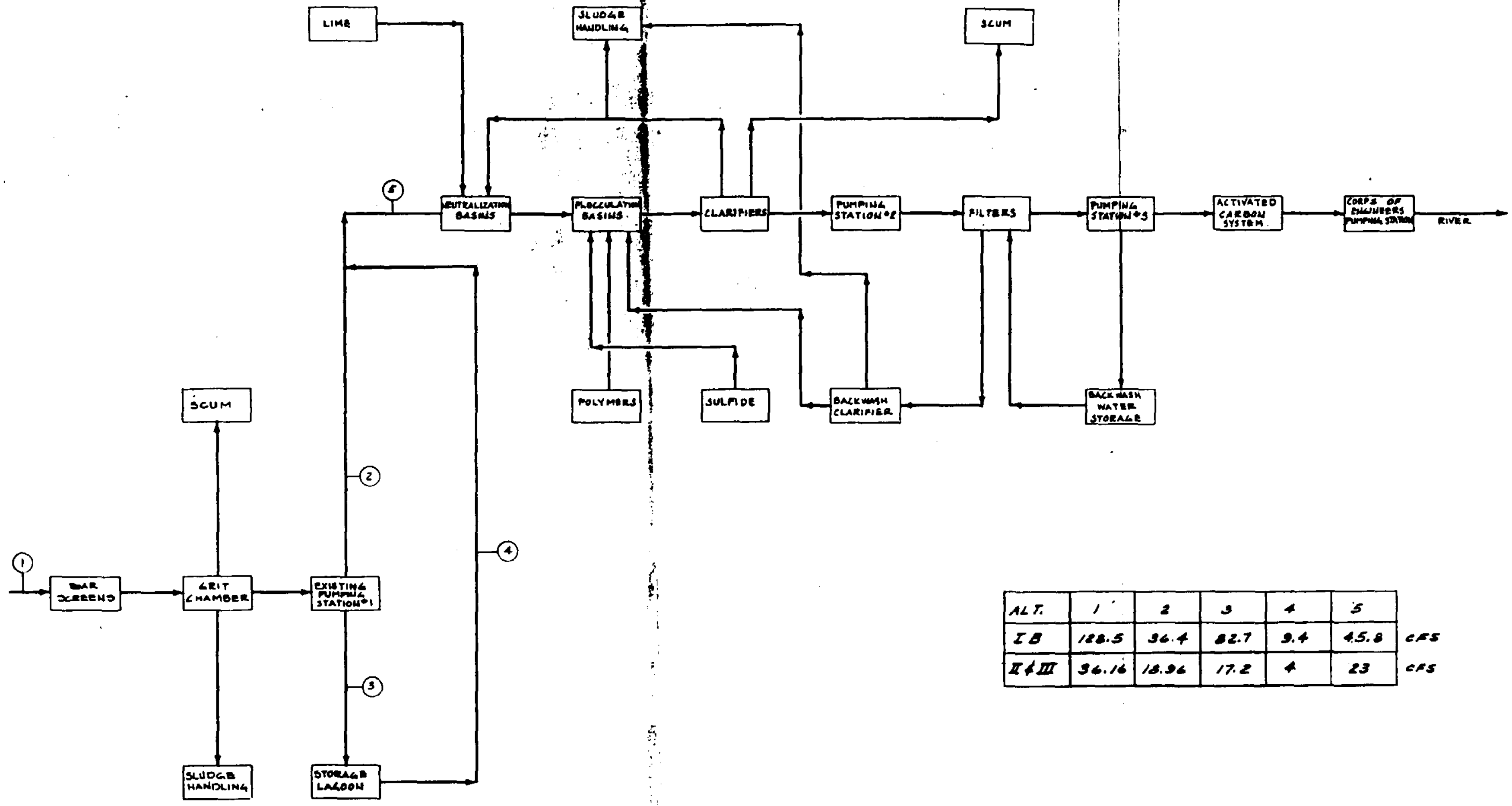


MONSANTO ENVIRO-CHEM SYSTEMS INC.

FLOW DIAGRAM-ALTERNATIVE-I-A
TREATMENT PLANT
VILLAGE OF SAUGET

0733

3-12

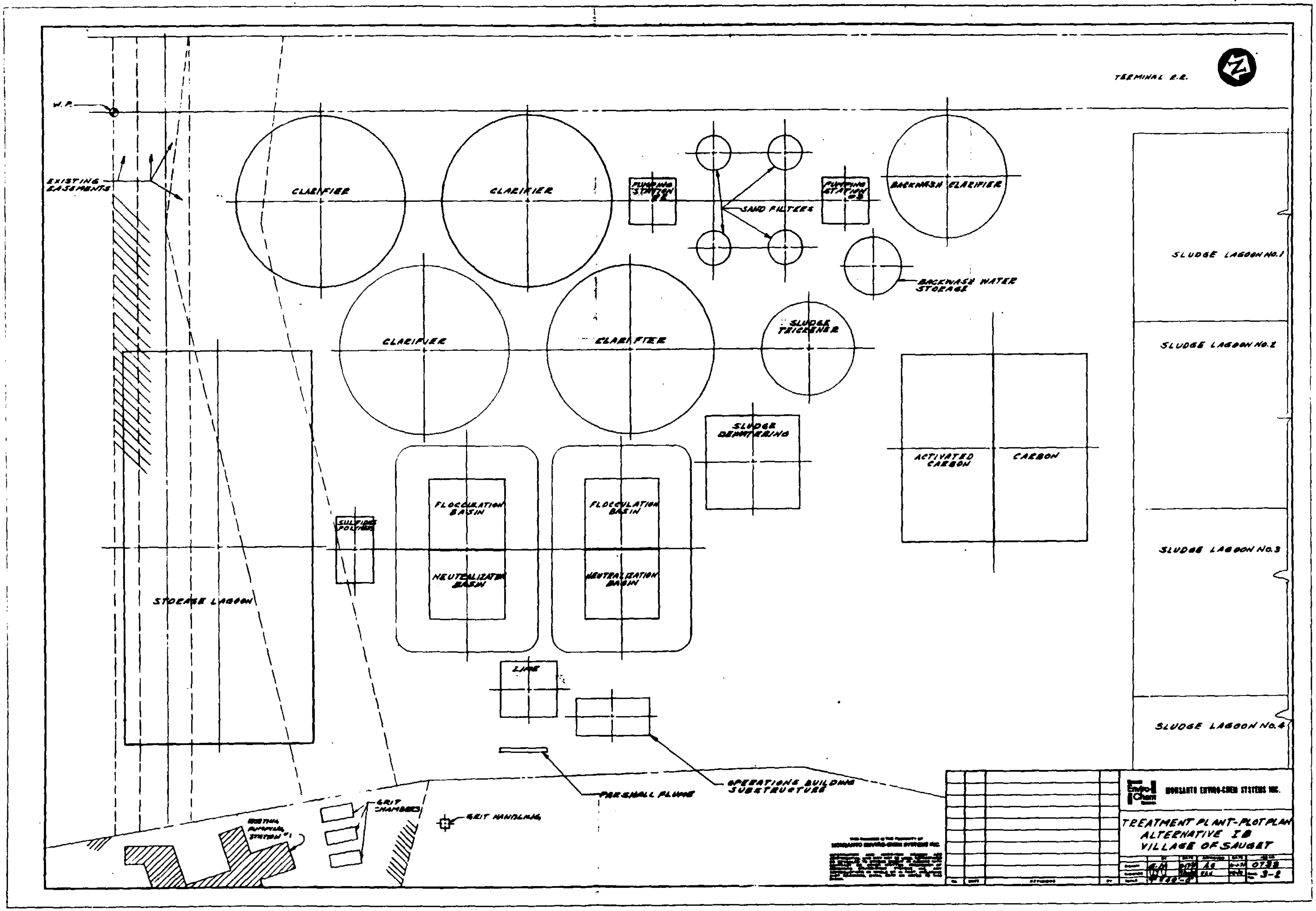


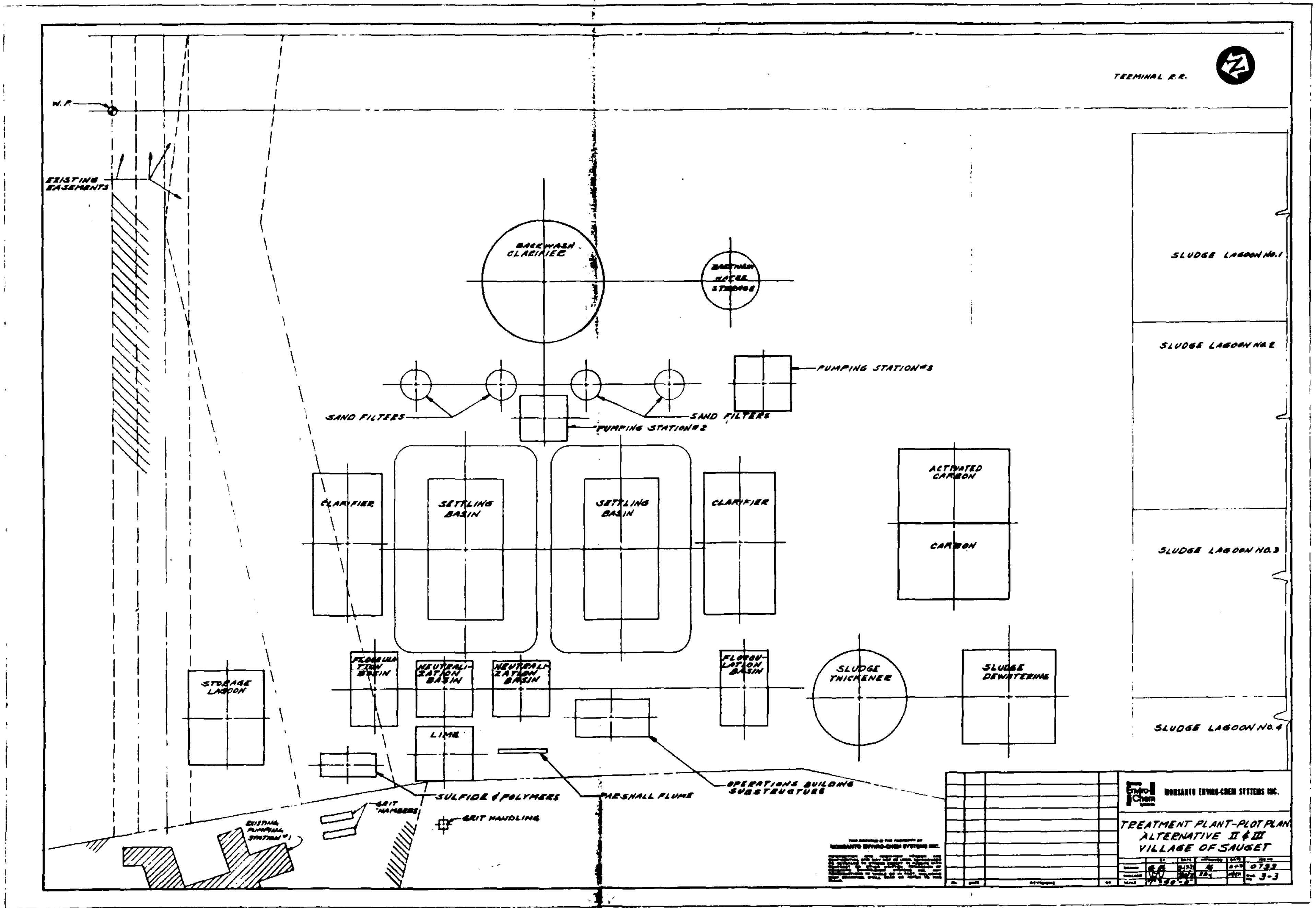
ALT.	1	2	3	4	5	
I B	128.5	36.4	82.7	9.4	45.8	CFS
II & III	36.16	18.96	17.2	4	23	CFS

MONSANTO ENVIRO-CHEM SYSTEMS INC.

FLOW DIAGRAM ALTERNATIVE
TREATMENT PLANT
VILLAGE OF SAUGET
I B, II, III

0783
5-13


TERMINAL R.R.
W.P.
EXISTING EASEMENTS
CLARIFIER
CLARIFIER
CLARIFIER
CLARIFIER
PUMPING STATION #2
SAND FILTERS
PUMPING STATION #3
BACKWASH CLARIFIER
BACKWASH WATER STORAGE
SLUDGE THICKENER
SLUDGE DEWATERING
ACTIVATED CARBON
CARBON
SULFIDE POLYMER
FLOCCULATION BASIN
NEUTRALIZATION BASIN
FLOCCULATION BASIN
NEUTRALIZATION BASIN
STORAGE LAGOON
LIME
PARSHALL FLUME
OPERATIONS BUILDING SUBSTRUCTURE
GRIT CHAMBERS
GRIT HANDLING
EXISTING PUMPING STATION #1
SLUDGE LAGOON No.1
SLUDGE LAGOON No.2
SLUDGE LAGOON No.3
SLUDGE LAGOON No.4
MONSANTO ENVIRO-CHEM SYSTEMS INC.
TREATMENT PLANT-PLOT PLAN
ALTERNATIVE IB
VILLAGE OF SAUGET
3-2



TERMINAL R.R.
W.P.
EXISTING EASEMENTS
BACKWASH CLARIFIER
BACKWASH WATER STORAGE
PUMPING STATION #3
SAND FILTERS
SAND FILTERS
PUMPING STATION #2
CLARIFIER
SETTLING BASIN
SETTLING BASIN
CLARIFIER
ACTIVATED CARBON
CARBON
SLUDGE LAGOON NO. 1
SLUDGE LAGOON NO. 2
SLUDGE LAGOON NO. 3
SLUDGE LAGOON NO. 4
STORAGE LAGOON
FLOCCULATION BASIN
NEUTRALIZATION BASIN
NEUTRALIZATION BASIN
FLOCCULATION BASIN
SLUDGE THICKENER
SLUDGE DEWATERING
LIME
SULFIDE & POLYMERS
PARSHALL FLUME
OPERATIONS BUILDING SUBSTRUCTURE
GRIT CHAMBERS
GRIT HANDLING
EXISTING PUMPING STATION #1
MONSANTO ENVIRO-CHEM SYSTEMS INC.
TREATMENT PLANT-PLOT PLAN
ALTERNATIVE II & III
VILLAGE OF SAUGET
3-3

PRELIMINARY DESIGN AND COST ESTIMATES

Design and Estimating Assumptions

In preparing the preliminary designs and cost estimates for inplant sewers, sumps, overhead lines, Village sewers, and the treatment plant, the following assumptions were made:

Process Waste Flows:

1) Flow data from previous Monsanto Enviro-Chem studies are valid.
2) No significant changes in process wastes will occur.
3) 6.1 MGD of cooling water from American Metals Climax will go to the storm sewer.

Storm Water Flows:

1) Storm runoff was calculated for a 2 year storm of one hour duration - 1.4" hour.
2) Storm water runoff will be allowed to go to the river untreated.

Sewer Routing, Sump Locations:

1) Each industry was contacted concerning location of sewers, sumps, and equipment but no in-depth study was conducted.

Process Design:

1) Carbon capacity at different waste concentrations was predicted from pilot plant data for present concentration.
2) Clarifier design based on present pilot plant clarifier overflow rate of 300 gal/day-ft^2.
3) Polymer requirements based on preliminary pilot plant data.
4) Multi-media filter design based on prior experience. No experimental work was conducted.
5) Sludge thickening and dewatering based on preliminary pilot plant work.
6) Sludge disposal costs based on hauling to a sanitary land fill.
7) No air polution control devices were included for the activated carbon regeneration furnace because of incomplete data. It would have the same economic impact on all cases because the regeneration furnace will be the same size for all cases.

Overhead Pipelines:

Existing pipe racks can handle additional load.

Soil Conditions:

1) Minimum of 3 kips (3000 lbs/ft^2) soil bearing capacity at frost line.
2) No pilings were included.
3) Shoring was included for excavations.
4) Test borings and soils tests to be paid for by customer.

Site:

1) Clear and level site with no obstructions above or below grade.
2) No interference from ground or surface water.

Equipment:

All prices are estimates with no firm quotes.

Backfill:

All material excavated is suitable for backfill.

Utilities:

1) Customer will supply all construction utilities to a point on the battery limits of the treatment plant.
2) Customer will supply and install all operating utilities to a point on the battery limits of the treatment plant.

Permits Licenses:

Customer to procure and pay for all permits, licenses, etc. required for construction and erection.

Fire Protection:

None included.

Safety Equipment:

No safety showers or eyewashes included.

Capital Costs

The capital cost figures presented should be considered as rough engineering estimates with an accuracy no greater than plus or minus 35%. If one were to rank the estimates as to accuracy then the estimates for Alternatives IA & IB should be considered more accurate than II & III, and II should be considered more accurate than III because of the smaller amount of underground piping work in II relative to III.

The estimated capital costs for the various alternatives are as follows:

IA

$13,400,000 Treatment Plant

IB

$14,700,000 Treatment Plant

II

$11,100,000	Treatment Plant
5,000,000	Inplant & Village Modifications
$16,100,000	

III

$11,100,000	Treatment Plant
2,800,000	Inplant & Village Modifications
$13,900,000	

Financing Considerations

The Village of Sauget's gross bonding power for general obligation bonds is approximately $2,300,000. It will be assumed that the net bonding power of the Village at the time of construction will be $1,500,000 for general obligation bonds. It is not clear how the plant will be financed. In calculating the operating costs all annual costs except amortization of capital will be listed and various cases will be considered for alternative financing methods.

Because of the doubt about saleability of revenue bonds it will be assumed that the industries will buy the bonds. It will also undoubtedly be necessary for the Village to have separate sewer service agreements with each industry for a specified period of time to cover the bonds.

For the various cases, the financing assumptions are as follows:

Case X

IA		IB	
G. O. Bonds 15 yrs., 5-1/2%	$ 1,500,000	G. O. Bonds 15 yrs., 5-1/2%	$ 1,500,000
Revenue Bonds 30 yrs., 6%	11,900,000	Revenue Bonds 30 yrs., 6%	13,200,000
	$13,400,000		$14,700,000

II		III	
G. O. Bonds 15 yrs., 5-1/2%	$ 1,500,000	G. O. Bonds 15 yrs., 5-1/2%	$ 1,500,000
Revenue Bonds 30 yrs., 6%	11,600,000	Revenue Bonds 30 yrs., 6%	10,100,000
Private Capital 10 yrs. Straight Line Depreciation- Zero value after 10 years.	3,000,000	Private Capital 10 yrs. Straight Line Depreciation- Zero value after 10 years.	1,300,000
	$16,100,000		$13,900,000

Case Y

Private capital with 10 year straight line depreciation and zero salvage value after 10 years.

Case Z

Private capital with 5 year straight line depreciation and zero salvage value after 5 years.

It should be understood that the 10 year and 5 year straight line depreciation cases are for comparison only, showing the effect of the rate of amortization on the total operating costs. These methods are not being recommended or proposed. Five year depreciation would not be possible for all of the modifications required by the Village and industries. The Federal Environmental Protection Agency published guidelines in the Federal Register of September 29 for certification of pollution control facilities. Industry may qualify for 60 month amortization under Section 169 of the Internal Revenue Code for some control devices.

The following types of water pollution control equipment are normal eligible for certification: (1) pretreatment facilities, such as those which neutralize or stabilize industrial and/or sanitary waste, from point immediately preceding the point of treatment to a point of disposal to, and acceptance by, a municipal waste treatment facility for final treatment; (2) treatment facilities which neutralize or stabilize industrial and/or sanitary waste; (3) ancillary devices such as lagoons, ponds, and structures for storage and/or treatment of waste waters; (4) devices, equipment, or facilities constructed or installed for primary purpose or recovering a byproduct (saleable or otherwise), previously lost either to the atmosphere or to the waste effluent.

Inplant process changes which may prevent production of pollutants, contaminants, wastes, or heat, but which cannot be said to remove, alter, dispose of, or store pollutants, are not eligible. Also equipment included in disposal system for subsurface injection of untreated or inadequately treated industrial or sanitary waste waters or effluent containing pollutants are not eligible (1).

In Table 1 the indirect operating costs have been listed in $/1000 gallons for the three different cases mentioned above.

(1) Air/Water Pollution Report, page 404, 10/4/71

Table 1

Amortization*

Indirect Operating Costs ($/1000gal.)

Alternatives	IA	IB	II	III
Case X				
1st 10 yrs.	0.118	0.103	0.239	0.188
next 5 yrs.	0.118	0.103	0.184	0.164
next 15 yrs.	0.101	0.089	0.156	0.136
Case Y				
1st 10 yrs.	0.156	0.137	0.297	0.256
next X yrs.	0	0	0	0
Case Z				
1st 5 yrs.	0.312	0.274	0.594	0.512
next X yrs.	0	0	0	0

*Includes all capital for treatment plant, Village sewer modifications, and industrial modifications.

Direct Operating Costs

Direct operating costs for the treatment plant include chemicals and materials (i.e. carbon, lime, polyelectrolyte, sulfide, and miscellaneous chemicals and supplies), sludge handling and disposal waste, utilities, manpower, and maintenance.

The basis for calculation of the direct operating costs have been shown in Table 2 and the resulting costs in Table 3.

Total Operating Costs

In Table 4 the total operating costs for the three different financing methods have been listed.

Table 2
Basis for Direct Operating Cost Estimates

Item	Quantity	Total Price	Alternative
Lime	84.5 tons/day	$20/ton	IA, IB, II, & III
Polyelectrolyte	(1 mg/l)	$1.60/lb	IA, IB, II, & III
Carbon (Total)	9.17 lbs/1000 gal	$0.26/lb	IA
(7% loss of total)	7.66 lbs/1000 gal	$0.26/lb	IB
	16.16 lbs/1000 gal	$0.26/lb	II & III
Misc. Chem. Supplies	---	$0.010/1000 gal	IA, IB, II & III
Sludge Disposal	100 tons dry solids/day	$2/ton	IA, IB, II & III
Manpower*	8 men	$5/hour	IA, IB, II & III
Utilities* (power)	---	8 mill/kw-hr	IA, IB, II & III
Maintenance*	---	2% of capital	IA, IB, II & III

*Does not include carbon system.

Table 3

Direct Operating Cost ($/1000 gal)

Alternative	IA	IB	II	III
Carbon*	0.231	0.195	0.396	0.396
Lime	0.072	0.057	0.114	0.114
Polymers	0.013	0.013	0.013	0.013
Misc. Chem. & Supplies	0.010	0.010	0.010	0.010
Sludge Disposal	0.009	0.007	0.014	0.014
Utilities (power*)	0.005	0.006	0.005**	0.004
Manpower	0.015	0.012	0.023	0.023
Maintenance*	0.021	0.021	0.038	0.038
Totals	0.376	0.321	0.613	0.612

*Carbon costs include carbon makeup costs, fuel & power, maintenance & manpower for carbon system.
**Includes power for inplant pumps.

Table 4
Total Operating Costs ($/1000 gal)

Alternative	IA	IB	II	III
Case X				
Direct Operating Cost	0.376	0.321	0.613	0.612
Indirects	0.118	0.103	0.134	0.164
	0.494	0.424	0.797	0.776
First 10 Years				
Total Cost/Yr	$4,250,000	$4,570,000	$4,320,000	$4,200,000
Case Y				
Direct Operating Cost	0.376	0.321	0.613	0,612
Indirects	0.156	0.137	0.297	0.256
	0.532	0.458	0.910	0.868
First 10 Years				
Total Cost/Yr.	$4,560,000	$4,940,000	$4,940,000	$4,700,000
Case Z				
Direct Operating Cost	0.376	0.321	0.613	0.612
Indirects	0.312	0.274	0.594	0.512
	0.688	0.595	1.207	1.124
First 5 Years				
Total Cost/Yr.	$5,900,000	$6,400,000	$6,540,000	$6,110,000

CONCLUSIONS AND RECOMMENDATIONS

Because of the limits of accuracy for the various estimates, it is not possible to adequately differentiate between the alternatives on an initial cost basis. Operating costs are also very comparable for the different alternatives because the major direct operating costs do not change from one alternative to the other. Essentially the same amount of acid must be neutralized for each case as well as the same amount of organic contamination removed by the carbon.

One should, however, keep several thoughts in mind when judging the alternatives:

(1) There is no guarantee that water that has been assumed to be uncontaminated process and storm water actually will meet criteria not yet established or proposed by the State.

(2) Capital costs for Alternative II would probably be much closer to that for Alternative III if an underground tile sewer had been assumed for II instead of the overhead lines and sumps or if a detailed study had been conducted to determine costs associated with working around underground obstructions.

(3) The cost estimates for Alternatives IA and IB are undoubtedly more accurate because they only required design and cost estimates for the treatment plant. The work for Alternatives II and III involved design of segregation and treatment stystems within each plant as well as Village sewer modifications. It is our feeling that our estimate for this inplant work and sewer work is probably low. A much more detailed study involving representatives from each industry in the design details would be required to provide a more accurate estimate.

(4) If Alternative II or III were chosen, design and construction within plants and the Village sewer modifications would probably prevent

meeting the Village's proposed date for treatment plant start-up. More experimental work would also be required to design the treatment plant for half the flow and twice the pollutant concentration.

(5) Alternatives II and III would reduce the amount of flooding and would also offer "new sewers".

(6) Alternatives II and III would offer better control of wastes and an incentive to segregate where ever possible.

(7) Expansion capacity would be available for industrial expansion for Alternatives IB, II, and III. With the excess flow capacity the storage lagoons could be enlarged to store storm water for a longer period of time and a portion of the flow capacity could then be utilized for industrial flow. Alternative IB would have more capacity available - <9.4 cfs for IB and <4 cfs for II and III.

(8) One alternative may be very favorable to one or more of the Village industries but not the best solution for the entire Village.

(9) Perhaps an inplant segregation system and bypass of the Village treatment plant should be considered by one or none of the industries even if the Village decides not to construct a segregated system.

(10) In order for each industry to decide which alternative will best solve their individual problems, a detailed breakout of costs may be required. This is beyond the scope of this report.

(11) Perhaps one or more of the Village industries should consider constructing a privately run treatment plant.

With the above mentioned thoughts considered, we will make the following recommendations:

(1) More study work in the form of detailed engineering design is required to improve cost estimates.

(2) If the Village decides not to have further study work done, then Alternative IA or IB should be chosen depending on state legislation. This would be the safest economic choice without further evaluation.

(3) If further study work is done, the following questions must be answered:

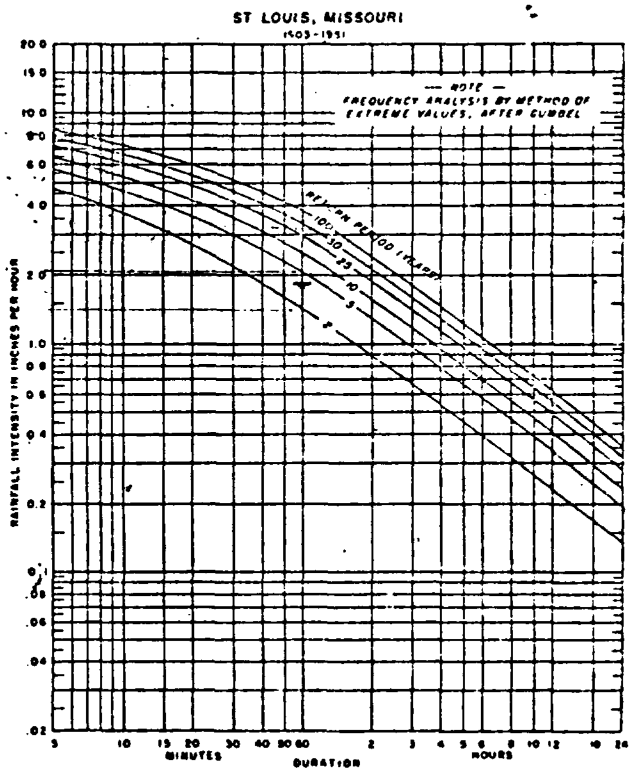
   (a) What is the best solution for each individual industry?

   (b) What is the best solution for the Village?

APPENDIX I

STORM WATER RUNOFF CALCULATIONS

RAINFALL INTENSITY - DURATION - FREQUENCY CURVES

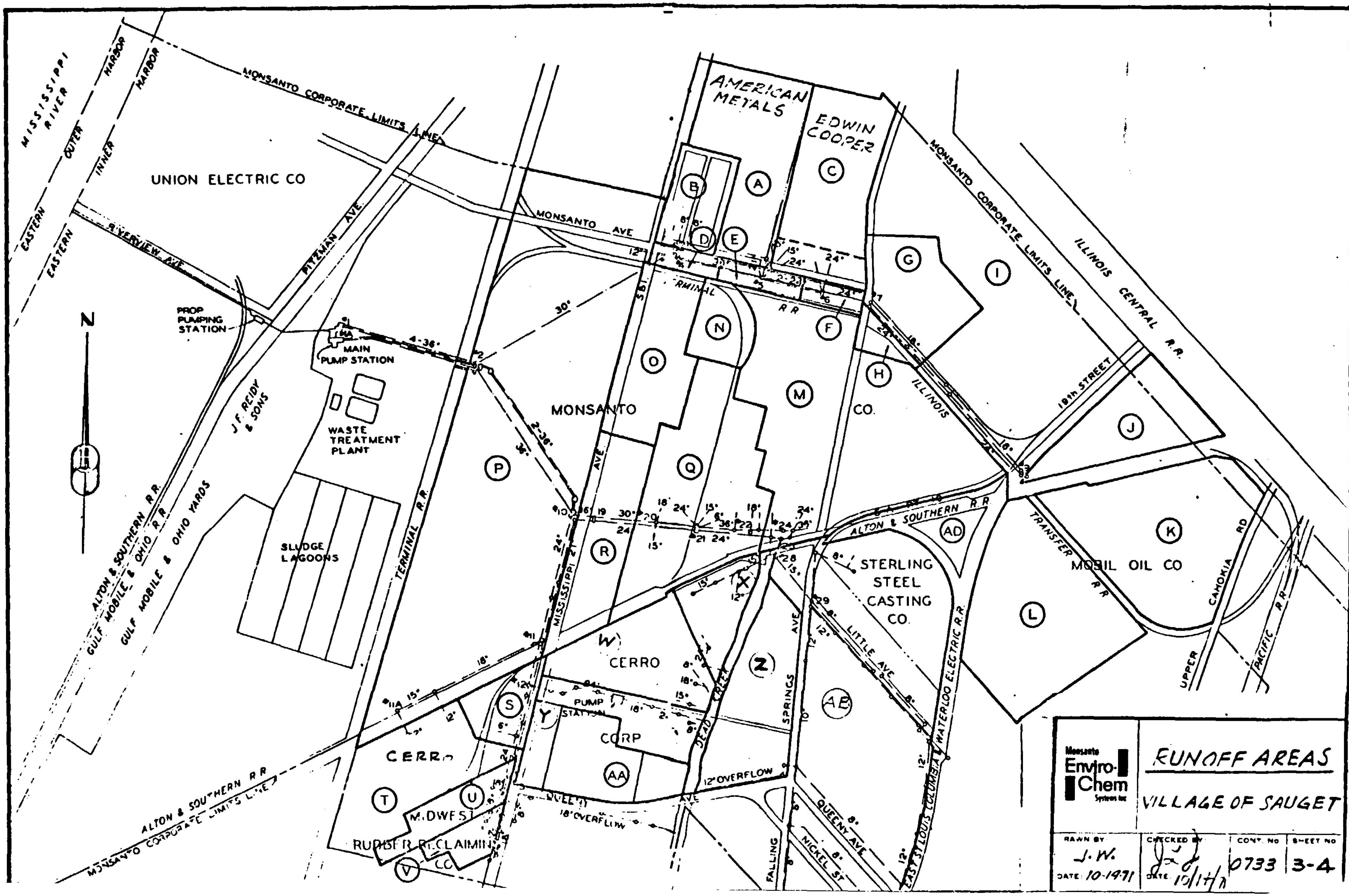


RUNOFF CALCULATIONS

Section	Area (Acres)	Runoff Coefficient	Flow (cfs)	Remarks
A	17	--	1.2	Balance to Seepage Pond
B	7	0.7	7.7	0.7 cfs from D
C	13.3	0.7	14.6	0.6 cfs from E, 0.9 cfs from F
D	2.0	0.7	0	0.9 cfs to B, 1.0 cfs to 0
E	2.8	0.7	0	0.7 cfs to A M, & N; 0.6 cfs to C
F	1.8	0.7	0	0.9 cfs to C & M
G	10	0.9	9.8	Parking Area
H	2.0	0.7	1.9	
I	--	--	--	Agricultural Area
J				From Pumping
K			16.7	Station, Maximum
L				Pumping Capacity
M	45	0.7	45.6	0.7 cfs from E; 0.9 cfs from F
N	5	0.7	5.6	0.7 cfs from E
O	14	0.7	14.7	1.0 cfs from D
P	---	---	---	Agricultural Area

Runoff Calculations (cont'd)

Section	Area (Acres)	Runoff Coefficient	Flow (cfs)	Remarks
Q	27	0.7	26.5	
R	14	0.7	13.7	Minor Flooding Allowed
S	--	--	1.0	Maximum Outlet Capacity
T	--	--	--	To Seepage Pond
U, V	8.1	0.7	7.9	
W	11.8	0.7	11.5	
X	10.0	0.7	9.8	
Y	3.0	0.7	2.9	
Z	16.7	0.2	4.6	
AA	6.0	0.7	5.9	
AB	5	0.7	4.9	Street and Residential Runoff
Total			206.5	

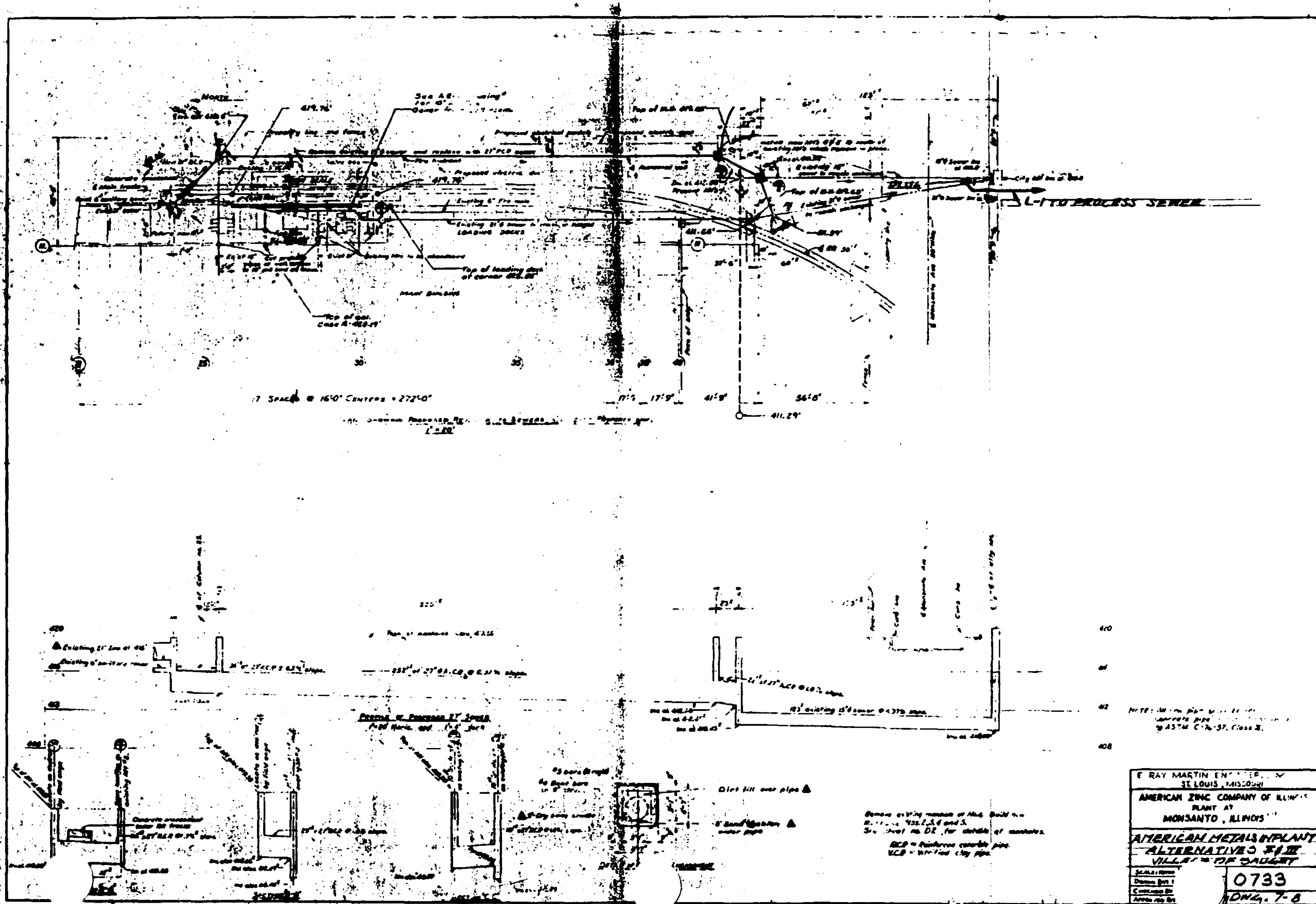


RUNOFF AREAS
VILLAGE OF SAUGET
Monsanto Enviro-Chem Systems Inc
DRAWN BY J.W.
DATE 10-1971
CHECKED BY
DATE 10/14/71
CONT. NO 0733
SHEET NO 3-4
N
MISSISSIPPI RIVER
OUTER HARBOR
INNER HARBOR
EASTERN
MONSANTO CORPORATE LIMITS LINE
UNION ELECTRIC CO
RIVERVIEW AVE
PITZMAN AVE
PROP PUMPING STATION
MAIN PUMP STATION
J.F. REIDY & SONS
WASTE TREATMENT PLANT
SLUDGE LAGOONS
ALTON & SOUTHERN R.R.
GULF MOBILE & OHIO R.R.
GULF MOBILE & OHIO YARDS
TERMINAL R.R.
MISSISSIPPI AVE
MONSANTO AVE
MONSANTO
AMERICAN METALS
EDWIN COOPER
TERMINAL R.R.
CO.
ILLINOIS
ILLINOIS CENTRAL R.R.
19th STREET
MOBIL OIL CO
TRANSFER R.R.
CAHOKIA RD
UPPER
PACIFIC R.R.
ALTON & SOUTHERN R.R.
STERLING STEEL CASTING CO.
CERRO
CORP
PUMP STATION
DEAD CREEK
SPRINGS AVE
LITTLE AVE
EAST ST LOUIS COLUMBIA & WATERLOO ELECTRIC R.R.
QUEENY AVE
NICKEL ST
FALLING
12" OVERFLOW
18" OVERFLOW
MIDWEST RUBBER RECLAIMING CO
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
AA
AB
AD

APPENDIX II

American Metals Climax Company
Inplant Modifications
Alternatives II & III

Item	Description	Function
L-1	Sewer Line	Tie into new sewer - Monsanto Ave.
L-2	Sewer Lines	Miscellaneous changes inplant



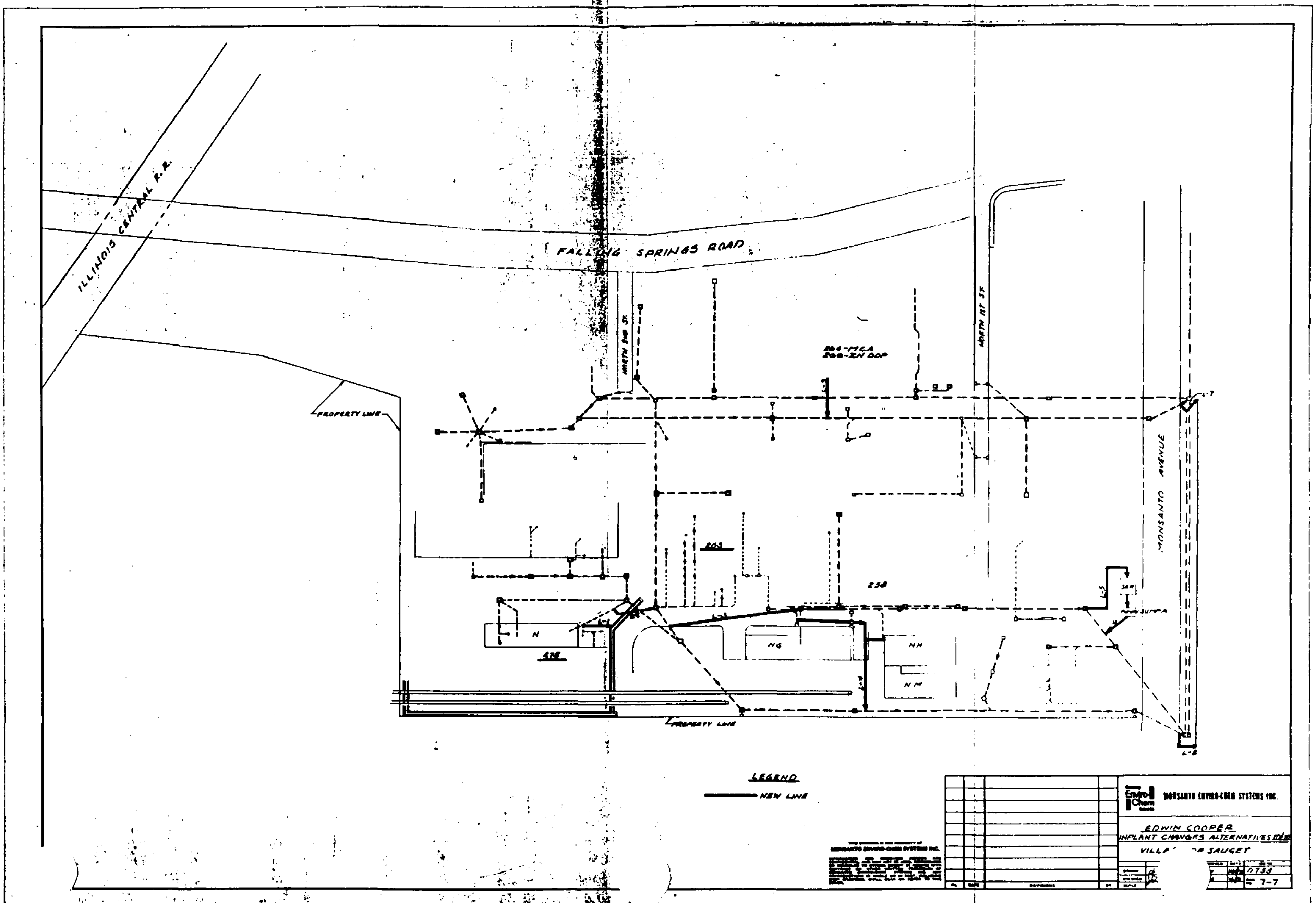
NORTH
L-1 TO PROCESS SEWER
LOADING DOCKS
Top of loading dock at corner
Top of gut.
17 SPACES @ 16'-0" CENTERS = 272'-0"
411.29'
PROFILE OF PROPOSED 27" SEWER
Dirt fill over pipe
Sand cushion under pipe
RCP = Reinforced concrete pipe.
VCP = Vitrified clay pipe.
E. RAY MARTIN ENGINEERING
ST. LOUIS, MISSOURI
AMERICAN ZINC COMPANY OF ILLINOIS
PLANT AT
MONSANTO, ILLINOIS
AMERICAN METALS IN PLANT
ALTERNATIVES
0733
DWG. 7-8

APPENDIX III

Edwin Cooper Inc.
Inplant Modifications
Alternatives II & III

Item	Description	Function
L-1*	Sewer Line	Dept. 225 to Drainage Ditch
L-2*	Sewer Line	Dept. 275 to Blending Area Junction Box
L-3*	Sewer Line	Dept. 285 to 258 Sewer 18"
L-4*	Sewer Line	Storm Sewer "H" St. to West Storm Sewer
L-5	Sewer Line	Line to Separator
L-6	Sewer Line	Line from Sump A
L-7*	Sewer Line	Tie into East process sewer
L-8*	Sewer Line	Tie into West process sewer
L-9*	Sewer Line	Depts. 264 & 266 to storm sewer
Sump A	Tile lined concrete pit	Pump effluent from separator
P-1	Centrifugal Sump	Pump for Sump A
S-1	Oil-water separator	Remove oil & floating solids

* Included in cost estimates



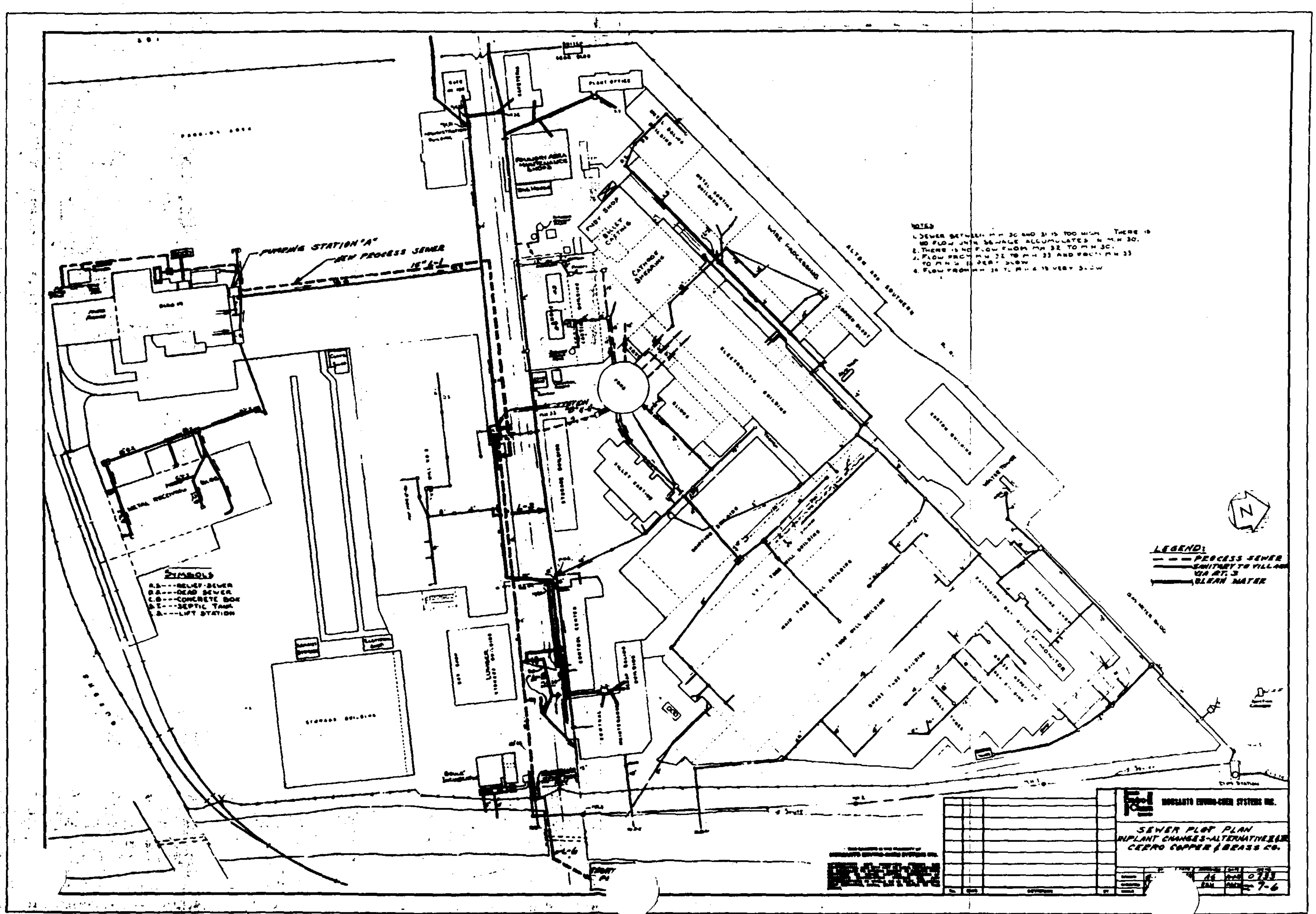
ILLINOIS CENTRAL R.R.
FALLING SPRINGS ROAD
NORTH 2ND ST.
NORTH 1ST ST.
MONSANTO AVENUE
PROPERTY LINE
PROPERTY LINE
258
N
NG
NH
NM
L-7
L-8
SUMP A
LEGEND
NEW LINE
MONSANTO ENVIRO-CHEM SYSTEMS INC.
EDWIN COOPER
INPLANT CHANGES ALTERNATIVES
VILLA OF SAUGET
0793
7-7

APPENDIX IV

Cerro Corporation
Inplant Modifications
Alternatives II & III

Item	Description	Function
Sump A	Concrete pit	Collection of process wastes
P-1	Centrifugal sump pump	Sump A
Sump C	Concrete pit	Collection of process wastes
P-2	Centrifugal sump pump	Sump C
L-1	Sewer Line	Sump A to Sump B
L-2	Sewer Line	Street drains
L-3	Sewer Line	From Tube Mill #2
L-4	Sewer Line	Slimes area to Pond
L-5	Sewer Line	From Metal Sorting Building
L-6	Sewer Line	Sump C to treatment plant

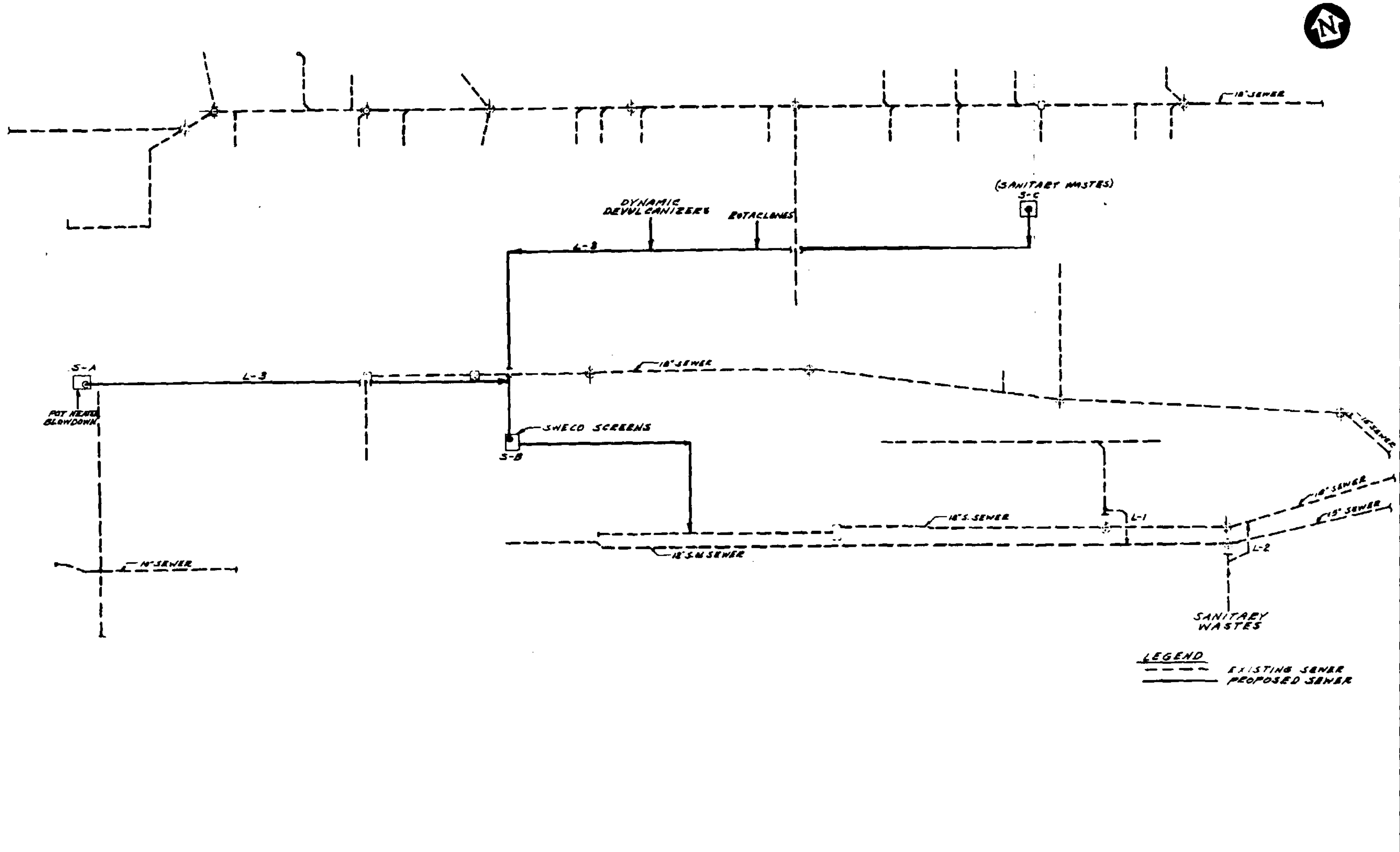
Treatment Plant (Neutralization, Sulfide, Flocculation, Sedimentation)


PUMPING STATION "A"
NEW PROCESS SEWER
NOTES
1. SEWER BETWEEN M.H. 30 AND 31 IS TOO HIGH. THERE IS NO FLOW UNTIL SEWAGE ACCUMULATES IN M.H. 30.
2. THERE IS NO FLOW FROM M.H. 32 TO M.H. 30.
ALTON AND SOUTHERN
WIRE PROCESSING
BILLET CASTING
CATHODE SHEARING
ELECTROLYTIC BUILDING
SYMBOLS
R.S.---RELIEF SEWER
D.S.---DEAD SEWER
C.B.---CONCRETE BOX
S.T.---SEPTIC TANK
L.S.---LIFT STATION
METAL RECEIVING
STORAGE BUILDING
LEGEND:
PROCESS SEWER
SANITARY TO VILLAGE VIA RT. 3
CLEAN WATER
N
MONITOR
MONSANTO ENVIRO-CHEM SYSTEMS INC.
SEWER PLOT PLAN
INPLANT CHANGES-ALTERNATIVE
CERRO COPPER & BRASS CO.
0733
7-6

APPENDIX V

Midwest Rubber Reclaiming Company
Inplant Modifications
Alternatives II & III

Item	Description	Function
L-1	Sewer Line	Line from 8" sewer to 12" storm sewer
L-2	Sewer Line	Shower room to 18" sewer
L-3	Overhead Sewer Lines	Convey wastes to 18" sewer
S-A	Sump	Pot heater blowdown collection
P-1	Sump Pump	Sump A
S-B	Sump	Sweco waste collection
P-2	Sump Pump	Sump B
S-C	Sump	Sanitary waste collection
P-3	Sump Pump	Sump C



MONSANTO ENVIRO-CHEM SYSTEMS INC.

WATER HANDLING - INPLANT CHANGES
ALTERNATIVE II & III
MIDWEST RUBBER RECLAIMING CO.

0723

7-9

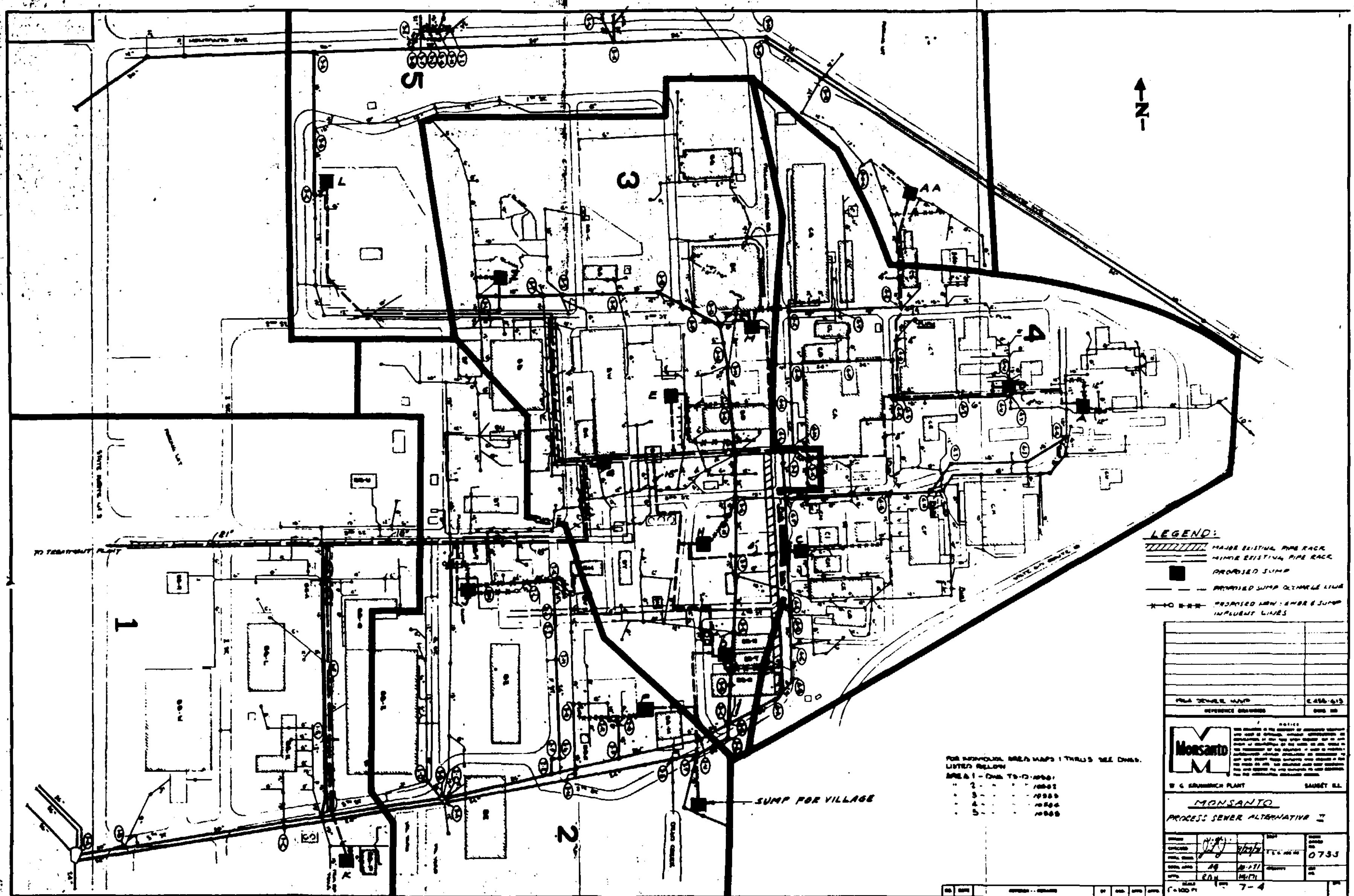
istes

APPENDIX VI

Monsanto Industrial Chemicals Company
Inplant Modifications
Alternative II

Item	Description	Function
Overhead lines	Reinforced fiberglass pipe	Convey Wastes to treatment plant
Su[illegible] feed lines	VCP	Convey wastes from departments to sumps

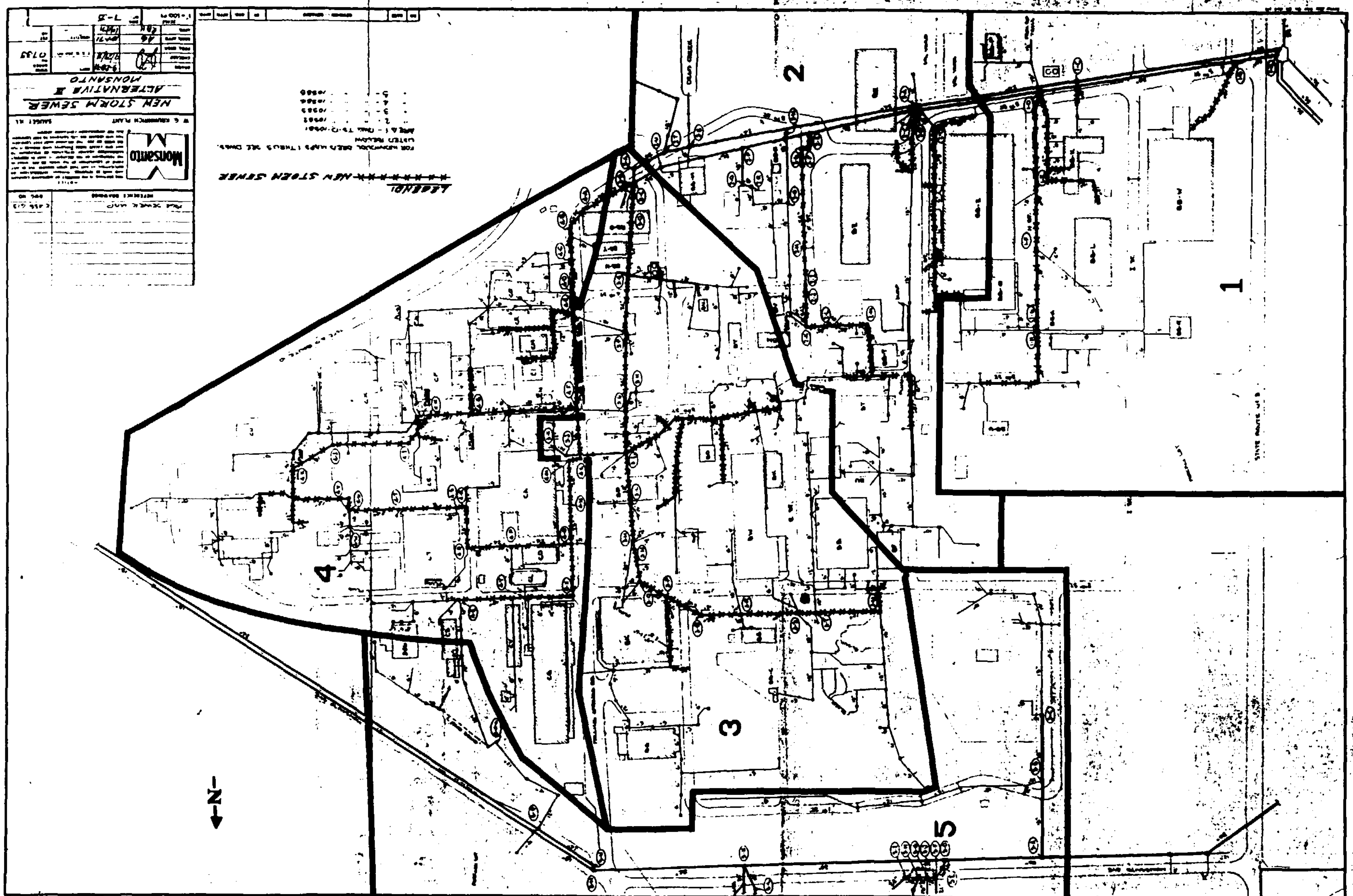
erhead


TO TREATMENT PLANT
SUMP FOR VILLAGE
1
2
3
4
5
-N-
LEGEND:
MAJOR EXISTING PIPE RACK
MINOR EXISTING PIPE RACK
PROPOSED SUMP
PROPOSED SUMP DISCHARGE LINE
PROPOSED NEW SEWER & SUMP INFLUENT LINES
MONSANTO
PROCESS SEWER ALTERNATIVE II
W. G. KRUMMRICH PLANT
SAUGET ILL.
0733
7-4

APPENDIX VII

Monsanto Industrial Chemicals Company
Inplant Modifications
Alternative III

Item	Description	Function
L-1	12" RCP - 1200'	Storm Sewer
L-1	24" RCP - 375'	"
L-2	12" RCP - 1430'	"
L-2	24" RCP - 805'	"
L-3	12" RCP - 2030'	"
L-3	24" RCP - 1450'	"
L-4	12" RCP - 2350'	"
L-4	24" RCP - 1200'	"
L-4	36" RCP - 625'	"



Monsanto
NEW STORM SEWER
ALTERNATIVE II
MONSANTO
LEGEND
NEW STORM SEWER
1
2
3
4
5
-N-